SCIENTIFIC AMERICAN

A Weekly Review of Progress in

INDUSTRY · SCIENCE · INVENTION · MECHANICS

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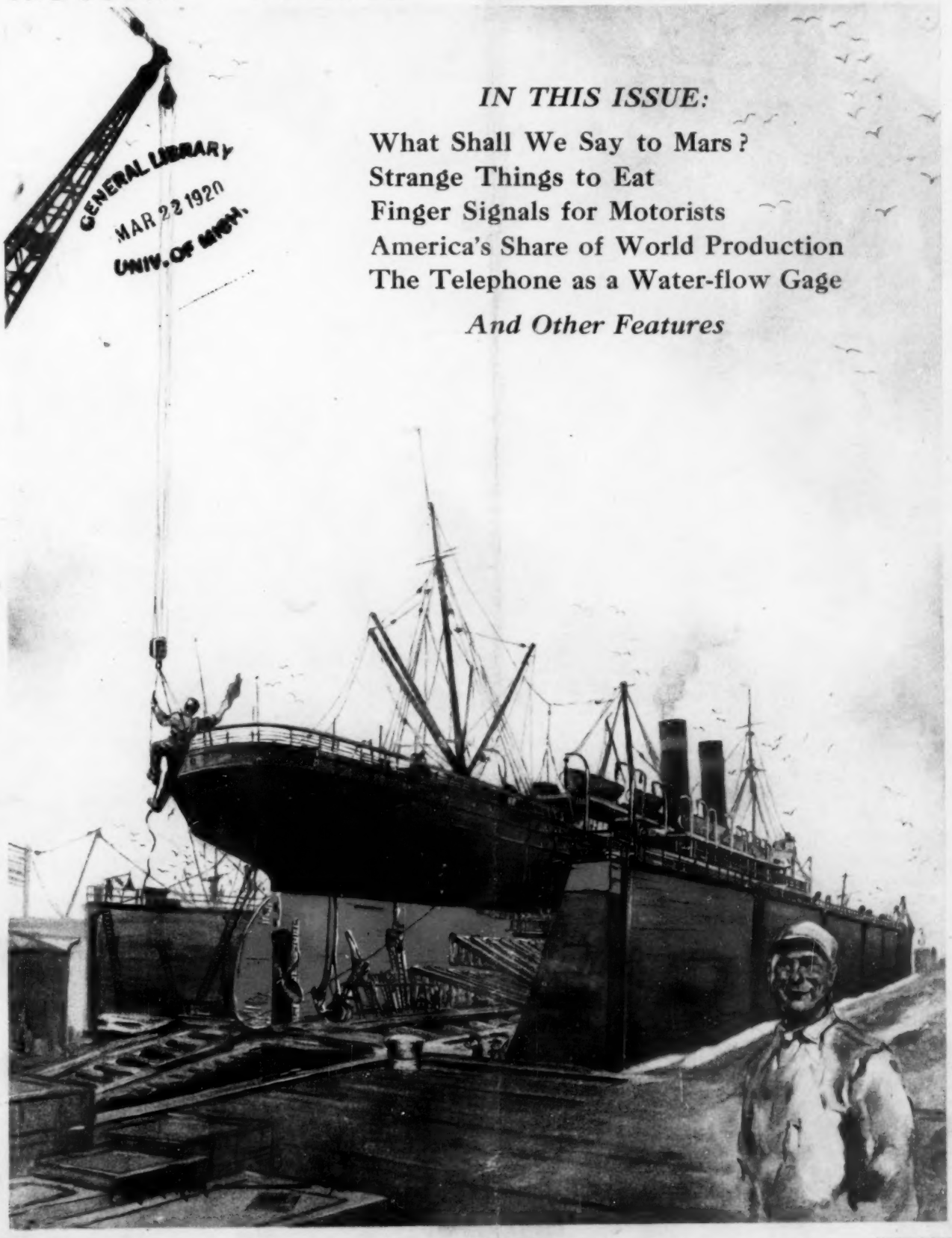

FITTING THE SECTIONAL DRY DOCK TO THE SHIP—[See page 307]

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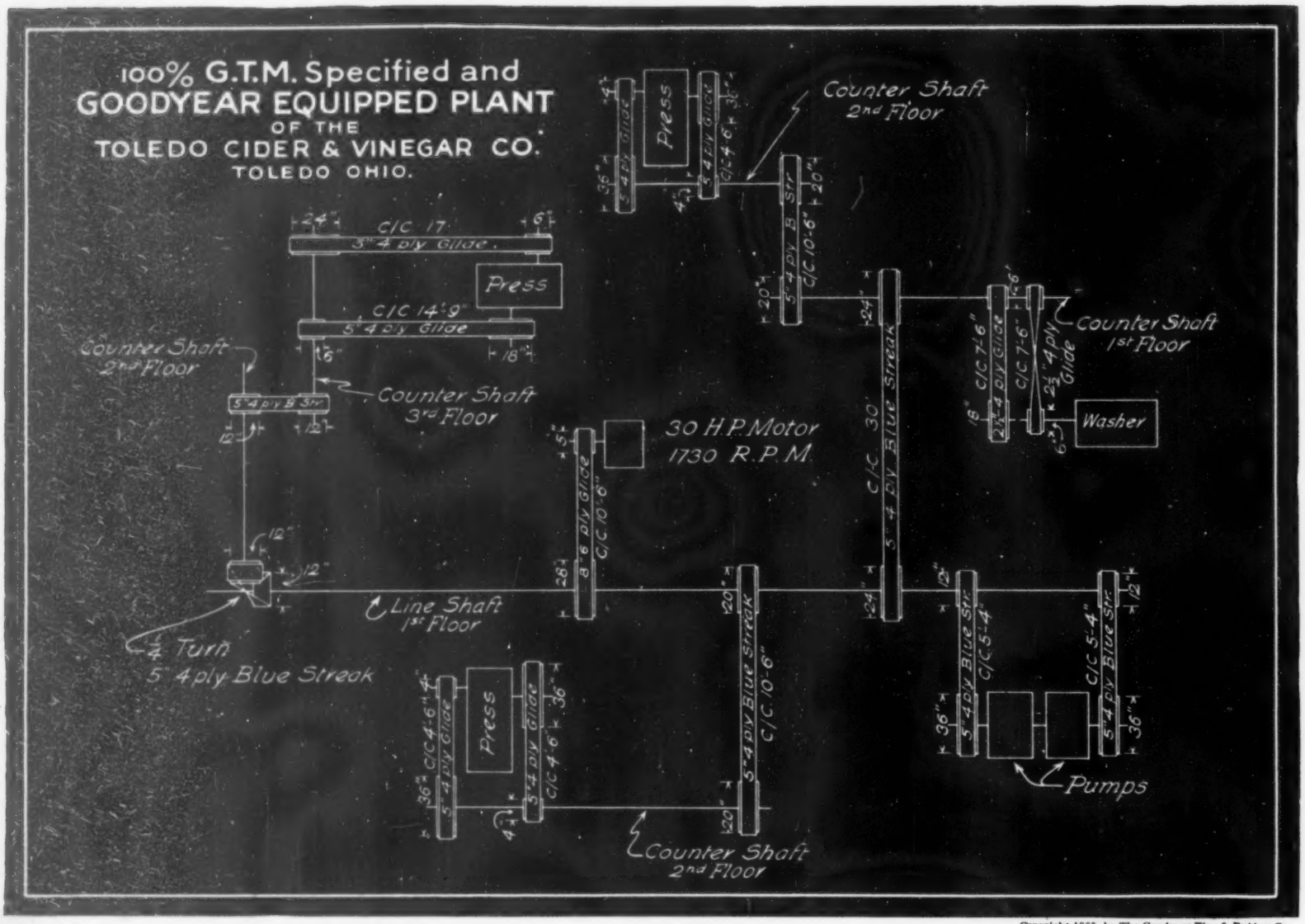

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100% Goodyear-Equipped—and the G.T.M.

A growing conviction that the Goodyear analysis plan gave promise of ending their continual troubles with belts led the Toledo Cider & Vinegar Company to have a single drive studied by a G. T. M.—Goodyear Technical Man—and his recommendation for a belt given the benefit of a trial.

The G. T. M. did not say offhand, "Put on a Goodyear Belt." His first request was to see the drive for which a belt was wanted. He studied the actual conditions under which the belt must operate. He figured pulley dimensions, center-to-center distances, operating speed required. He noted that a belt to be successful in this plant must resist the action of vinegar acid. In a word, he went to work on the principle that a belt is an integral part of the plant's production line.

The results from the Goodyear Belt applied after this study made their own argument for an extension of the analysis to the entire plant. The G. T. M.-specified Goodyear Belt held the pulleys, where other belts—bought on the basis of taking whatever the jobber happened to have in stock—slipped, and lost power, and tied up units in troubles and delays that cost money.

100% Goodyear-equipped today — this is the result of expert study followed by the service that Goodyear Belts specified to their work always yield. On the press drives there are Goodyear Glide Belts. On the main-to-counter-shaft transmission, and on pumping duty, are 5-inch, 4-ply Goodyear Blue Streak Belts—heavy, flexible, and enduring. In line with the same principle of every unit's relation to the work of the whole plant, the G. T. M. specified 5-ply Goodyear Monterey Acid Hose for the conveying of the product pressed out under the action of the power carried by the belts. At the end of a full season's run, the Goodyear equipment shows practically no wear and has furnished new records for energy conserved and power transmitted.

Single drive or entire plant, the G. T. M. looks at any problem put up to him in the light of its relation to profitable production. And the Goodyear Belt he recommends is chosen first for its ability to perform its part unfailingly, trouble-free, over a long period of economical service. The G. T. M.'s services are at your and your plant superintendent's command, without charge. Your profit and satisfaction from Goodyear Belts specified on the basis of his analysis are ample assurance of our return.

BELTING · PACKING · HOSE · VALVES

GOODYEAR

Plan for Good Roads–Now!

Bad Roads waste money

Before—
Photograph shows condition of road leading from La Crosse, Ind., before "Tarvia-X" was used.

NOW is the time to plan for good roads—and by that we mean roads that are good all the year round—free from mud, bumps and ruts in winter and spring, and free from dust and dirt in the summer and fall. *Such roads are the greatest asset any community can have.*

They stimulate business. They increase property values. They lower taxes. They cut delivery cost. They tap new sources of supply. They broaden your markets. They also add much to the comfort and convenience of life.

And good roads, contrary to popular opinion, are *not* expensive.

The experience of thousands of towns all over the country, which use Tarvia regularly, absolutely prove this. In many instances the mere *saving* in maintenance amounts to *more* than the cost of the Tarvia treatment.

Whether you require a good binder for new construction, a dust preventive or a patching material—there is a grade of Tarvia to meet your needs.

As we said at the beginning: *"Now is the time to plan for good roads."*

So talk to your neighbors, to your road officials, and last but most important, write about your road problems to our Special Service Department, and booklets covering the subject and further information will be supplied promptly without charge.

Tarvia Roads save money

After—
The same piece of road as that shown at the left after being rebuilt with "Tarvia-X"

Tarvia

Preserves Roads–Prevents Dust

Special Service Department

In order to bring the facts before taxpayers as well as road authorities, The Barrett Company has organized a Special Service Department, which keeps up to the minute on all road problems.

If you will write to the nearest office regarding road conditions or problems in your vicinity, the matter will have the prompt attention of experienced engineers. This service is free for the asking. If you want *better roads* and *lower taxes*, this Department can greatly assist you.

New York, Cleveland, Birmingham, Seattle, Youngstown, Chicago, Cincinnati, Kansas City, Peoria, Toledo, Philadelphia, Pittsburgh, Minneapolis, Atlanta, Columbus, Duluth, Milwaukee, Richmond, Latrobe, Boston, Detroit, Nashville, Washington, Elizabeth, St. Louis, New Orleans, Salt Lake City, Johnstown, Buffalo, Dallas, Bangor, Bethlehem, Baltimore, Lebanon

The Barrett Company

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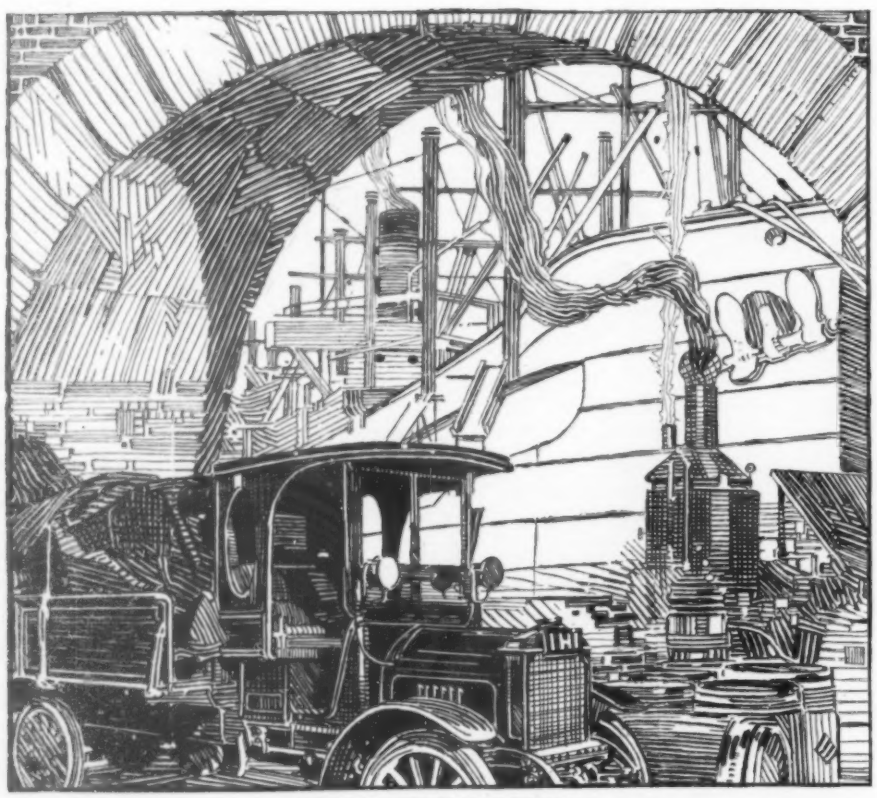

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—in addition to Federal Trucks,

MULTIBESTOS
BRAKE LINING

is factory equipment on 60% of American motor cars and trucks.

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Briscoe	Maxwell	Atterbury	Kleiber	Boring
Chalmers	McFarlan Six	Autohorse	Maccar	Dauch
Chandler	McLaughlin	Available	Master	Emerson-Brantingham
Cleveland	Milburn Elec.	Brockway	Maxwell	G-O
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Commonwealth	Moore	Collier	Moreland	Illinois Super Drive
Crow-Elkhart	Olympian	Concord	Mutual	Indiana
Cunningham	Packard	Conestoga	O-K	Massey-Harris
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Dorris	Saxon	Dodge	Selden	
Economy	Seneca	Dorris	Seneca	AXLES
Elcar	Shaw	Fageol	Service	Liggett
Empire	Simplex	Ford	Signal	Peru
Grant	Standard	Fulton	Standard	Russel
Haynes	Stanley	Gabriel	Sterling	Salisbury
Holmes	Studebaker	Garlord	Studebaker	Standard
Hupmobile	Texan	Giant	Sullivan	Timken
Jackson	Texas	G-M-C	Tiffin	Torbensen
Jones	Velie	Hahn	Tower	Wisconsin
Jordan	Westcott	Hall	U. S.	
Liberty		Hendrickson	Velie	MOTOR CYCLES
	TRUCKS	Hewitt-Ludlow	Watson	Excelsior
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SUPPOSE you were asked to select a jury to determine the best brake lining. Wouldn't you choose America's foremost automotive engineers? Wouldn't you have most confidence in their knowledge and experience? You could be sure they would have every facility for investigation, analyses and tests. And wouldn't you, as a motorist, be willing to abide by their decision?

On this basis, you should choose MULTIBESTOS to reline your brakes. Automotive engineers have chosen it overwhelmingly for factory equipment—six out of every ten American automobiles are originally equipped with it. Probably your car is among them—check the above list and see.

Don't take chances on a matter of such grave importance. For safety's sake—for lasting satisfaction—reline your brakes with MULTIBESTOS.

Send for valuable free booklet "The Care of Your Brakes"

MULTIBESTOS COMPANY
WALPOLE, MASS., U.S.A.

SEVENTY-SIXTH YEAR

SCIENTIFIC AMERICAN

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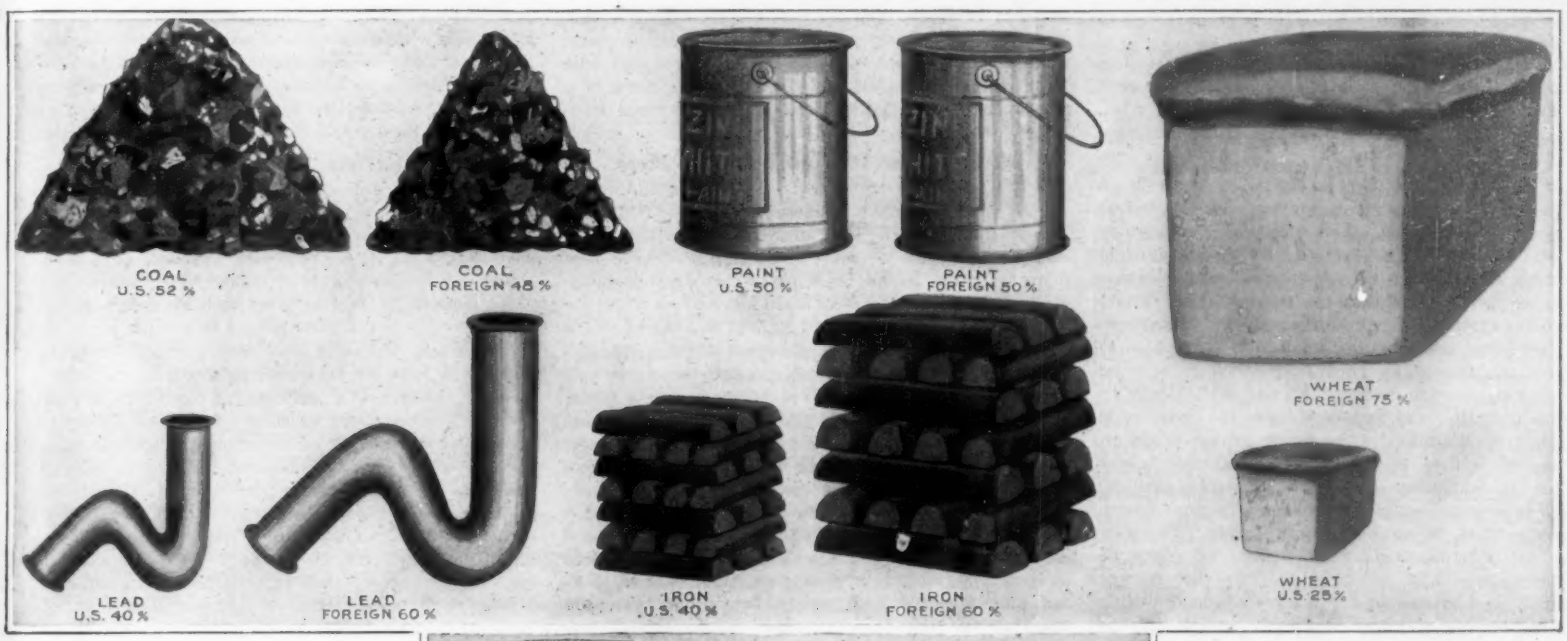

The place which the United States holds in the plans for world reconstruction is indicated by these diagrams. In each case the two figures are proportional in size to the production of the United States and of the rest of the world in the field covered by the sketch. The comparison is made more definite in each instance by a statement of the percentage of the world's total attributable to the United States and to all other countries.

America's Share in World Production

By Ralph Howard

THERE are many commodities which are hardly produced at all in the United States—others, like raw rubber, in which we could even dispense with the qualifying "hardly" in denying our share of the world's sources of supply. Equally there are many raw and manufactured articles in which production lies fairly even between many countries, the United States among them. But there are at the same time a number of fundamental items in the schedule of the world's production, for which the United States holds the lion's share of the responsibility.

When we realize that the comparison about to be made is between the United States on the one side and the rest of the world on the other, we will understand that any commodity of which the United States produces half or nearly half may be thought of as lying largely in our hands. For taking us against all the other nations at once, half the total production of a given item is far above our fair share. In any field where our production attains such a disproportionate figure we are the dominating factor.

At all times such a position is one of great importance and great significance. The Germans even thought to bring the war to a rapid conclusion through their complete domination of the potash supply of the world. At the present moment full supplies of all essential materials are of almost as much importance as in the fall of 1914; for where at that time failure of some raw material might have spelled disaster in the war for any of the belligerents, today a full and certain supply is essential for the great business of reconstruction. Our dominance in certain fields of production gives us an outstanding position in this business, which may be a fortunate circumstance in so far as it puts certain other nations more or less at our mercy, but which is rather unfortunate in its depressing effect upon foreign exchange and through this on foreign trade.

Our greatest dominance is in the manufacture of automobiles and trucks—we make 85 per cent of all that are made, leaving but 15 per cent for Britain, France, Germany and Italy. The citizen who can call to mind the names of celebrated motors and machines that are made in all of these countries may wonder for a moment how we are able to maintain any such numerical superiority; but if he will reflect that for every English or French or German or Italian car of distinction he can name half a dozen American manufacturers whose product is on the same plane, and that the production of any of our leading cars alone would swamp that of all the leading European manufacturers combined, he will have answered the riddle.

If we pass from this superlatively "manufactured" article to the more fundamental raw materials, we shall soon see why Europe needs us in her work of reconstruction. Fifty-two per cent of the world's coal gives us a conspicuous place in power production, but not neces-

(Continued on page 312)

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The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.

The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.

Paper

AUTHORITIES differ as to why there is a shortage of paper for printing; some lay it at the door of labor, others attribute it to a shortage of pulp for which labor is not responsible, and again we are told that if a continuous and adequate supply of fuel could be assured the mills they would be able to meet all demands upon them. But whatever the cause, there is no difference of opinion as to the result. Many daily papers have had to suspend or curtail publication, many others are publishing with extreme difficulty, and more and more the shortage is being felt by the users of the better grades of paper.

There was a time, in the good old days, when it was possible to build up a reserve of paper, holding enough in warehouse for the printing of several issues. But today there is no such thing as this. The publisher has exhausted whatever reserve of paper he may once have had, as completely as the average housewife had exhausted her reserve of sugar during the first season of sugar shortage; but unlike the average housewife, he has not been dble to re-establish his reserve. The result is that he lives from hand to mouth; if he is lucky he gets paper in about as fast as he uses it up, and if he is unlucky he uses it up a little bit faster than it comes in. In any event he is wholly dependent upon the current supply.

Of course the publisher has his regular source of paper, covered by contract. But this contract merely provides, in effect, that the mill will supply the necessary amount of paper for printing each issue, when, as and if it can. When it can't, it naturally doesn't, and the publisher has nothing to do but go out into the open market and buy paper when, as and if he can find it. This means that he must take what paper he can locate, regardless of its character, regardless of whether it remotely resembles that he has been using, regardless of whether it is suited for his purposes.

Our readers must have noticed that the paper on which the SCIENTIFIC AMERICAN has recently been printed has displayed lack of uniformity. More specifically, most of our readers will have noted that their copies of our last issue, for March 13th, were the worst yet—that they were in fact printed on paper little if any better than ordinary newspaper stock. We want to make it clear that this is not the result of any effort at economy on our part, and that it is due entirely to causes beyond our control.

Owing to the storm of March 4th, our paper-maker found it impossible to deliver all the paper for the issue in question. We had on hand enough paper only for about one-third of the issue; after these copies had been run off, our presses actually had to stand idle for twenty-four hours while we combed the New York paper market for something on which to print the rest of the issue. When we finally found some paper that was not covered by contract, we had to snap it up at once, without pausing to consider its quality.

As we write we do not know where the paper is coming from to print the present issue. We expect that we shall have to stop the presses again pending receipt of paper of some sort, from some source. We do not know what this paper will look like, and hence do not know whether the issue will call for an apology. We do not know whether mailing will be delayed by delayed printing due to delayed receipt of paper. If neither of these things happens in the present issue, however, both of them will doubtless happen with later issues. So we take this occasion to extend a general apology to our readers for any crimes against the printing arts which we may have to commit in the next few months. Such crimes will be committed in the interest of avoiding what we hope would seem the greater crime of failing to publish at all. Whatever paper we may use is not the paper of our choosing, but simply the paper we are able to get. If our readers will realize that the matter is entirely out of our hands, entirely out of the hands even of the paper-makers—if they will take us as they find us and extend thanks that the appearance of our pages is no worse than it is—if they will realize that we are doing the best we can—we shall ask no more. Rest assured we do not like it any better than the most fastidious reader, and that we will return to a permanently decent garb as soon as it is a human possibility for us to do so.

Archaic Plans for New York City Piers

UNLESS the intelligent voters, the influential press and the business interests of this city intervene, the Port of New York will be committed irrevocably to the construction of twelve new piers at Staten Island, upon plans that are unbelievably out of date. Contracts were signed last week for six of these piers at a cost of $6,738,148, none of which will be wider than 130 feet and some of them only 125 feet in width. In this respect the new structures will be hampered by the same lack of spaciousness which handicaps the majority of the existing piers in this city. No provision is made for running freight cars, either alongside the ships or into the sheds, and securing all the consequent economies in time and labor.

Furthermore, the proposed docks are not provided with the modern, labor-saving, freight-handling equipment which is to be found in the specious modern piers at rival ports such as Philadelphia, Montreal and Halifax, and at the leading European ports like Liverpool, London, Antwerp and Hamburg, where intelligence, vision and foresight have been displayed to a remarkable degree in providing up-to-date trans-shipping devices, railroad facilities and means of access for motor vehicles, as well as for the sorting and storing of the cargoes of modern steamers.

The typical New York pier is a long and relatively narrow structure, with a pier shed, more often than not only one story in height, extending entirely across the pier, except for a narrow roadway between the shed walls and the string piece of the pier, to give access to the mooring posts. At intervals along the walls are old fashioned derrick booms of the kind that has been used from time immemorial. Enter one of these sheds and you will find them crowded with freight, with an all-too-narrow space down the center, into and out of which the loaded trucks squeeze their way to load or unload as the case may be. Conspicuous by its absence either outside or inside the shed, is that ingenious freight-handling machinery which is such a conspicuous feature at the magnificent municipal docks at Philadelphia and other rival ports on this continent.

Even if our city authorities were alive to the value of this freight-handling machinery, they could not use it—so limited is the space, so great the congestion. And as a consequence of our archaic methods, at any hour of the day and on any day of the year you will find the marginal street outside the piers crowded with teams, sometimes three and four deep, waiting their turn, frequently for hours at a time, to deliver or receive their loads within the pier shed.

Such conditions go far to explain why it is that frequently it costs as much to transfer freight at New York from train to ship as it does to ship it by rail from points situated hundreds of miles inland.

How utterly out-of-date is the type of dock which so frightfully handicaps our city is shown by a consideration of the spacious and finely equipped Philadelphia docks. These are so broad, that there is room for a standard-gage railroad track extending the full length of the pier on each side of the shed, and for two more such tracks running through the center of the pier shed—four tracks in all. Thus freight from interior points can be loaded direct to the ship, or to any point within the shed, with all the advantages of sorting and classified storage which this implies.

What makes the precipitate letting of these contracts doubly reprehensible is the fact that they have met with the practically universal condemnation of the engineers, the shipping experts and the technical press of the city. The officials of the Dock Department not only have not sought but have deliberately flouted the judgment of the men who have made a study of port facilities, many of whom were engaged in designing and building the fine modern docks in France which so greatly facilitated the rushing of supplies to our army.

Rarely has this city been confronted with a case of administrative ineptitude in the carrying out of public works, which called so loudly for instant protest and strong corrective measures. There should be a combined demand by the business interests, the press, and all citizens who are concerned for the future of our city, that before any construction is undertaken, the plans for these new piers be made public, and be subjected to careful consideration, with a view to bringing them in line with the latest and most approved construction.

The Hierarchy of Knowledge

IN contrast with our present civilization and the wide diffusion of intelligence, it is sometimes pointed out that among the ancients special knowledge was a privilege, jealously guarded, of a small class, such as the priests of the Egyptian temples.

We wonder whether in years to come future generations may not look back to our day with much the same feeling. Einstein was recently credited in the daily press with the statement that only about a dozen men were capable of understanding his theory of gravitation. The statement seems to have evoked in certain quarters some degree of resentment disguised under a cloak of pretended amusement. While no one will seriously attempt to make an exact numerical estimate of the persons competent to follow Einstein's theory in its details, and possibly the round dozen may be an under-estimate, there can be no doubt whatever that the number of such persons is a very small, an almost negligible fraction of the population of our civilized communities. This is no discredit to the average man who, whatever his native endowment, has not had the opportunity to put his mind through the rigorous training in mathematics needed for the treatment of Einstein's problems. But it does raise in our minds the question whether the contrast to which we have referred, between the wide dissemination of knowledge today and its restriction to the sacred pale of a favored few, in antiquity, is not, at least in part, a matter of perspective.

The fact is, if we only open our eyes, we can see on every hand today crass ignorance stalking unblushingly side by side with erudition and enlightenment. And this is true not only where circumstance has greatly restricted opportunity of acquiring knowledge. Alarming lack of information in matters of vital importance is seen in places where one should reasonably expect a better state of affairs. Thus we remember that at the time of the "Titanic" disaster one of the members of the commission appointed to investigate the causes of the catastrophy enquired "Why the passengers had not taken refuge in the water-tight compartments." Professor Gray, speaking before the British Association for the Advancement of Science at their last meeting, cites a case which came under his own observation: An "eminent counsel," in the course of legal proceedings in a case of some importance, involving practical applications of science, "quoted" one of Newton's laws of motion to the effect that "friction is the cause of oscillations." In another instance he heard it suggested by an eminent statesman that an electrical efficiency of 98 per cent might by the progress of electrical science be increased four-fold.

The totality of human knowledge has grown to dimensions far exceeding the capacity of any one man to hold at his command in his own mind. But even after making due allowance for this fact, such glaring displays of ignorance on fundamental facts and principles as cited above cast a heavy shadow of doubt on the adequacy of the social and educational system under which they are not only possible, but rather common.

Not in ancient Egypt alone has superior knowledge been a prerogative of a favored few.

Naval and Military Notes

Coast Defense Firing.—At the recent service night firing at Fort Winfield Scott, San Francisco, some excellent target results were secured. Using two 12-inch rifles on barbette mounts, and firing at a moving target at a range of 6,620 yards, 6½ hits were obtained out of 7 shots. The muzzle velocity of the shells was 2,055 feet per second. Another excellent record was made when two 6-inch rifles on disappearing carriages, using tracer shells, obtained twelve hits out of twenty shots. This practice was conducted at night under the handicap of the depleted personnel and composite companies—facts which rendered the result obtained particularly meritorious.

Dismantling of Heligoland Completed.—A dispatch from Berlin to the Associated Press states that the Heligoland defenses are today dismantled. The island and its thousands of tons of masonry and gun emplacements is all that remains of this once most formidable fortress. With the guns dismantled, the destruction of the military harbor works and various fortifications has proceeded. Although this stronghold cost over 175 million dollars, its guns were fired but once throughout the war, when the British warship "Shannon" was the target. The Allies recognized that it would have been impossible to silence its batteries. The artificial harbor works and the ground on which the barracks stand are to be removed and the site returned to the sea.

The Naval Dry Dock Problem.—The astonishing increase in the beam of capital ships which has taken place of late years has rendered the question of dry docks to accommodate these vessels a most acute one. An instance of this was seen in the recent trials of the battle-ship "Hood," which, because of the blisters had extreme breadth of 104 feet, and was unable to be docked at any of the English Channel yards and had to proceed to one of the North Sea Ports before she could be accommodated. The question is now receiving the serious attention of the Admiralty. Fortunately, we have six 1,000-foot docks built or building, which will be capable of accommodating our latest dreadnoughts of equal or slightly greater beam. It is evident, however, that this dry dock question will be the limiting feature, when the question of further increase in battleship dimensions comes up for consideration.

Washington as the Father of the Navy.—An article in the *United States Naval Institute* of last December by Edgar Stanton Maclay asked the question, Was George Washington the father of the United States Navy? According to this authority, before John Paul Jones or John Barry received their commissions, or, indeed, before Congress decided to establish a navy, Washington issued commissions on September 2, 1775, to armed craft for the expressed purpose of catching enemy transports and cruisers. Washington borrowed the armed schooners "Lynch" and "Franklin" from Massachusetts, and commissioned them to cruise against the enemy. He also commissioned other armed craft, including the "Lee." It was not until October 13th, 1775, that Congress appointed its first naval committee, and not until the 13th of December that Congress authorized the construction of the first vessels of our navy.

Our New Naval Ordnance Plant.—It was in 1916 that Congress appropriated $11,000,000 to build a plant for the manufacture of armor for ships of the Navy, and the next year $2,080,956 was appropriated for a projectile plant. Work was started August 30th, 1917, on a site of 207 acres at South Charleston, West Virginia. Excellent progress is being made, and the Navy will soon be in possession of what will probably be the most up-to-date plant of its kind in existence. The open hearth building is 516 x 225 feet, in which armor plate ingots of a size up to 200 tons will be handled. The forge and furnace building is 604 x 477 feet, and it has two large wings containing furnaces, with the press between these wings. The armor ingots are forged on a 14,000-ton press, on which gun ingots are hollow forged into lengths up to 93 feet. The heat treatment building is 320 x 112 feet, and 176 feet in height. The machine shop building is 552 x 320 feet. The plant will be in a position to manufacture armor plate up to 20 inches in thickness, and guns and shells up to 20 inches caliber.

Astronomy

Visitors to Yerkes Observatory on the Saturday afternoons of last summer numbered more than 8,000. For the benefit of these visitors, in groups of about 200, the operation of the large telescope, dome and floor was demonstrated by members of the staff, and at intervals of 30 or 45 minutes talks were given on some part of the work in progress at the observatory.

Franklin-Adams Chart of the Sky.—The Royal Astronomical Society has undertaken the publication of a second edition of this important photographic chart, which covers the whole sky in 206 sheets and shows stars down to the 16th or 17th magnitudes. The set of charts will be sold at £20. Subscriptions should be sent to the assistant secretary of the Royal Astronomical Society, Burlington House, W., London.

Spectroscopic Determination of Parallaxes.—Messrs. Adams and Strömberg, of the Mount Wilson Observatory, in a paper presented to the National Academy of Sciences, have reported the progress made at that observatory in the use of the process, devised a few years ago by Adams and Kohlschütter, of determining the luminosities and the parallaxes of stars by means of the intensities of certain lines in their spectra. Between 1,500 and 1,600 stars had been investigated in this way up to April, 1919, including nearly all stars with trigonometric parallaxes and an extensive list of those with very large and very small proper motions. In this connection it is stated that hardly a single serious contradiction was found between the spectroscopic and the trigonometric results.

The Diminished Importance of Solar Eclipses.—The technique of solar observations has made great strides since the days when a long list of the most interesting phenomena of the sun could be studied only during the brief duration of a total eclipse. In this connection it is worth while to quote the remarks of the director of the Mount Wilson Observatory, in the last annual report of that institution, one of the principal aims of which has been to develop instrumental methods permitting the regular daily observation of the phenomena in question. The forms of the prominences, says Prof. Hale, can now be studied more effectively in full sunlight than at eclipses, because they can be repeatedly photographed in plan on the sun's surface as well as in elevation at the limb. The spectrum of the lower chromosphere can also be dealt with more successfully in sunlight, at least so far as the precise determination of the positions of the lines is concerned. But to record the faintest lines of the flash spectrum and its changes in character at different levels we must still have recourse to eclipses. As for the corona, all attempts to observe it in full sunlight have hitherto met with no success. Ten years from now perhaps Director Hale will be able to tell us that these outstanding problems have also been solved.

Observation of Planetary Detail.—Some interesting experiments on the ability of various persons to observe different kinds of planetary detail have been carried on at the University of Glasgow by Mr. T. L. MacDonald. Six students, having no previous knowledge of the Martian problem, were invited to copy a drawing of Mars by Antoniadi, as well as two other pictures, one being a photograph of the moon (for canal-like markings). No suggestion was made to them either as to what would be visible or the manner of drawing it. An examination of the results brings out the curious fact that practically without exception the observer who excelled most in noting either canals, lakes or gradations of shading either did not excel or actually fell below the average in respect to the others. Thus the student who saw the most canals saw the smallest number of shadings and nearly the smallest number of lakes, etc. Moreover, the distinguishing characteristic of each observer remains through all the sets of drawings with remarkable persistency. Mr. MacDonald formulates tentatively the rule that the work of all planetary observers may be classed according to sensitiveness to lines, spots and shadings; of which excellence in one is exclusive of excellence in the remainder. Thus it may be possible to classify observers by three coefficients, for canal, spot and shade sensitiveness, and correct their work in planetary drawings accordingly.

Engineering

Engineering Standards for Tax Purposes seem to be suggested in the automobile license regulations about to go into effect in Great Britain. The new tax will be based on the supposed road-wearing effects of the vehicles, to be figured on a basis of weight and horse-power.

A Recent Derailment of a train near Vincent, Cal., was attributed in the official report to the fact that the elevation of the outer rail on a curve was not sufficient for the speed with which the train attempted to take the curve. It is pointed out that a train need not attain the "overturning speed" in order to meet disaster in rounding a curve, since long before that speed is reached the cars and engine rock back and forth sufficiently to throw the wheels off the outer rail.

The Revolving Electric Shovel is a recently introduced feature of iron-ore handling. It is differentiated from the large electric shovels employed in coal mining by having the power application that of field control in place of rheostat. This innovation eliminates the objectionably heavy peak-loads. The shovel is operated by one man, assisted by an oiler.

The Longest Concrete Girder Bridge has just been erected in Humboldt County, California, carrying a highway across the Salt River. Each span measures 142 feet from centers of supports, against 75 feet as the longest previous span for a true bridge of reinforced concrete, and for roof girders of 102 feet. For the data on these previous records we are indebted to *Engineering News-Record*.

High Pressure Work is carried to an extreme by Georges Claude, of Paris, in a recently developed process for ammonia synthesis which calls for a pressure of 1,000 atmospheres. As compared with the Haber process at 200 atmospheres, he gets several times the effectiveness of reaction, so that he need send his hydrogen and nitrogen through the apparatus only once to attain a concentration of ammonia which Haber cannot realize after repeated operation on the residual gases.

Belting Substitutes used in Germany during the war are illustrated for the first time in this country in a recent issue of *Power*. A construction of woven paper fiber, six-ply, was sold with the warning that it would transmit but 60 per cent of the load carried by a leather belt under identical conditions; it could not be tightened as much as the leather belt, and had frequently to be treated with a special preparation supplied by the belt-maker. Another ingenious belt was of wire links and twisted paper fiber. As far as pictorial appearances go, this one looks fairly serviceable.

The Kerkhoff Dam in the San Joaquin Valley of California was built in very quick time, mainly through the use of a "superposed trestle" which was built so as completely to enclose the intended dam section. This trestle was put up as soon as the foundation concrete had been laid inside the cofferdam that shut off the flow of the river. It was used as a basis for the laying of forms, the pouring of concrete, the setting up of the steel reinforcement, etc. As the rising concrete made it necessary to remove large portions of the trestle underpinning, the trestle was tied to the concrete itself by temporary sinker bolts. Largely through the advantages thus gained, the dam was completed in 238 days from the date when authority to proceed was obtained.

The Causes of Railroad Track Stress have been analyzed with the utmost thoroughness by a joint committee of the American Society of Civil Engineers and the American Railway Engineering Association. It is found that the ordinary static load of the heaviest train is a matter of little consequence, imposing no load which the rails are not amply able to withstand. But a large "speed effect," roughly proportional to the speed, is revealed, and it is found that the lack of balance in locomotives is very general and tremendously wearing upon the track. Also, in addition to throwing much light upon the various aspects of these matters, the report of the committee for the first time defines clearly, by measurements of bending and of load distribution through the ballast, the service given by the tie. Altogether, the investigation is a distinct advance in railroad engineering.

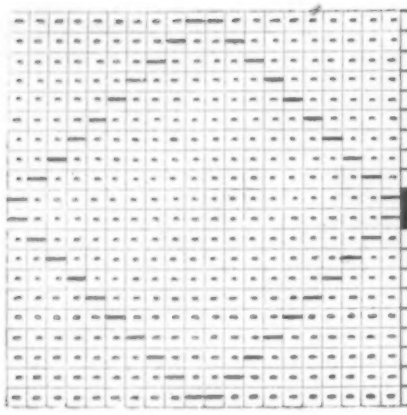


Fig. 5. Dots and dashes arranged to form a simple diamond

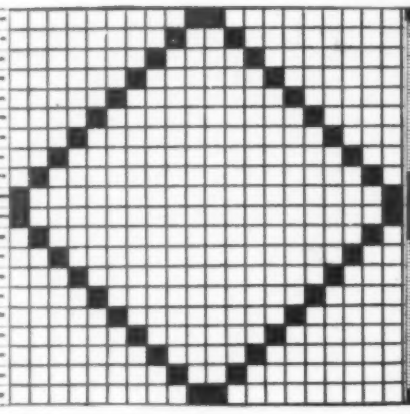


Fig. 6. Dashes of previous message plotted on quadrilled paper

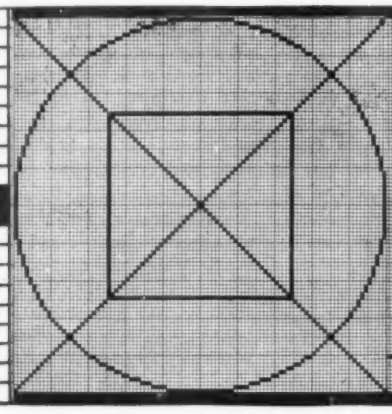


Fig. 7. A more elaborate message, with the dots again eliminated

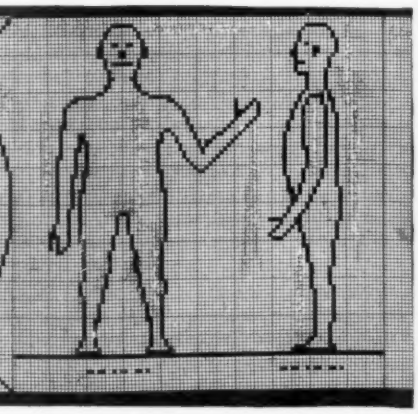


Fig. 8. A still more complicated message, depicting a man

What Shall We Say to Mars?

A System for Opening Communication Despite the Absence of Any Common Basis of Language

By H. W. and C. Wells Nieman

THE recent suggestion that the Martians are trying to send wireless signals to us may prove groundless, but it has at least called public attention to an important subject. The opinion is gradually prevailing that the possibility of interplanetary communication cannot be set aside on either technical or financial grounds. Wireless may not be able to bridge the gap, but light certainly is, and by the use of a system of heliographs and searchlights many authorities believe the problem can be solved—granted that the Martians have our keenness of eyesight and perfection of instruments. It is certain that the attempt to reach them will sooner or later be made. The idea of exchanging thoughts with intelligent beings on another planet is too alluring for the human imagination to resist, if there seems to be a reasonable chance of success. Of course it will require a great deal of money; not perhaps equal to the wild estimates of some critics, but at least more than any private individual could furnish. The project will therefore have to be backed by a strong popular desire for the experiment, which can only be brought about by thorough discussion and diffusion of knowledge of the factors involved.

IN these days of speculation as to the possibility of communicating across space with some of our neighbors in the Solar System, the question asked two weeks ago on our correspondence page is a pertinent one. Granted the physical means of communication, how might we proceed to establish the interplanetary vocabulary? Curiously enough, while the issue in which W. L. B. proposed this problem was still on the press, the article herewith, in which an attempt at solution is made, was placed in our hands. Messrs. Nieman, it must be conceded, if they have not given the answer to this puzzling question in an absolutely final form, have at least shown clearly that it could be worked out along the lines which they indicate. If the extent to which discussion of this rather unorthodox scientific matter has been carried is any criterion, we are sure the present article will prove of extreme interest.—THE EDITOR.

It is not the purpose of this article to suggest any particular form of apparatus to be used in signalling, but to propose a plan of building up a common language with our new correspondents when a practical method of signalling has been devised. It will no doubt be very thrilling to exchange flashes with each other, but no one will be satisfied with this alone. To bring the public to the necessary point of enthusiasm, they must be assured that an exchange of signals will rapidly develop into an exchange of ideas on any and all subjects of common interest. We want to talk over our scientific, social and religious notions with the Martians, and if they have a civilization far older than ours we want to learn from them truths that will help us in our own difficulties.

Apparently no one has tackled this problem seriously along the lines that must be followed. A French astronomer, years ago, brought up the scheme of constructing huge figures on the earth, by means of which we could gradually develop a pictorial language; but this is scarcely feasible, on account of the impracticably large figures required. For the present we shall be confined to dots and dashes, of wireless or light, as the case may be. With this limitation in view, the oldest suggestion is that we could prove Martian intelligence by mathematical tests. We could send two flashes, then four; and if they answered eight we would know they were multiplying. The process could be continued along similar lines without, however, getting us any nearer to a useful language. One astronomer suggested that we wait for an eclipse of our moon, and then send the word "eclipse," in Morse, for instance; but this, also, is slight help towards our goal. Some consider that if we received a great quantity of signals from Mars, in some code of its own, our experts could in time decipher the meaning—a possibility, of course, but a rather slim one. It would be infinitely harder than translating Egyptian hieroglyphics, and little progress was made there until the finding of the Rosetta Stone.

The problem, however, is by no means as difficult as it appears. The plan suggested in this article, original as far as the authors known, is one solution, and at least has the merit of simplicity. In describing it we shall ask the reader to imagine himself a Martian, of whatever form he is pleased to think proper for these beings. You may be a hundred feet high, with the strength of a dozen elephants, or the size of a mouse, with a score of legs. You must, however, be intelligent; that is a postulate of the problem.

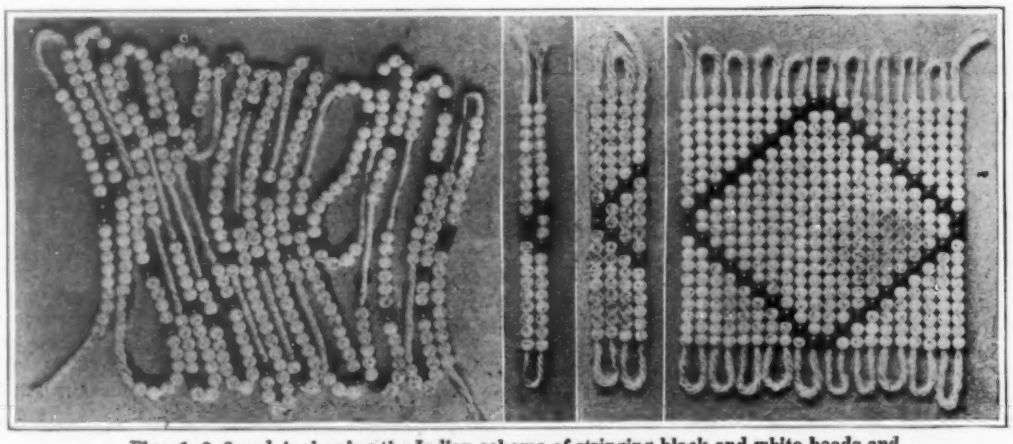
Your astronomers have just announced that signals are being received from the earth, consisting of dots and dashes regularly spaced. At the end of each block of, say, 20 signals, there is a pause, and after each 20 blocks a long delay, which apparently is the end of that message. All the flashes will, of course, be recorded, perhaps on a telegraph tape; or, to get as far away from ordinary conceptions as possible, let us assume that you use the Indian scheme of stringing beads. Your string of beads for the first message will look something like Figure 1, where a white bead represents a small flash and a black bead a large one.

Examination shows that each block consists of 18 white beads and two black ones, but not combined in the same order in each block. Obviously, you reason, no single block means anything; the blocks must be compared, and to do this, sooner or later it will occur to you to lay one block alongside the next. The first two blocks thus compared are shown in Figure 2. Thus far the message does not carry much suggestion, but, with the laying of a few more strings together the black and white beads develop into a figure, as shown in Figure 3; and presently there is revealed the simple but unmistakable diamond of Figure 4. If instead of beads, the flashes were recorded on a telegraph tape, the result would be the same, as shown on Figure 5, or the more striking diamond of Figure 6, if plotted on squared paper.

The next message will be more complicated as shown in Figure 7. Here the small dots are omitted entirely, as it soon becomes evident they do not contribute to the pattern; also the larger number of 100 flashes and 100 blocks is depicted instead of only 20 as in the bead illustration.

For a certain period of time you will receive a great number of similar simple figures, intended for practice, but soon more serious messages will reach you. One of the first of these is shown in Figure 8. As an intelligent being you must be familiar with the principles of pictorial representation, and while this may not conform to the Martian standard of art its intention is unmistakable; your knowledge of gravity, also, will enable you to place it right side up according to the horizontal line. To decide what the object is may be more difficult, but after

(Continued on page 312)



Figs. 1, 2, 3 and 4, showing the Indian scheme of stringing black and white beads and arranging them to form patterns

Paper from Cottonseed Waste

By S. R. Winters

MUNITION linters, cotton shavings and hull fiber, the by-products of cottonseed oil mills, are suitable for the manufacture of paper pulp, according to a series of tests just concluded by the Forests Products Laboratory of Madison, Wisconsin. The material is capable of being converted into high-grade book and magazine paper and low-grade writing paper.

When the armistice was signed, the Salvage Board of the Ordnance Department had a volume of approximately 3,000,000 tons or 12,000,000 bales of linters, purchased for the making of munitions. The left-over material indicated a financial loss inasmuch as Uncle Sam bought the linters for $4.67 a hundred pounds or an aggregate sum of $280,000,000. The seeming waste stimulated other branches of the government—the Bureau of Standards and the Forest Service—to devise a profitable outlet for placing the large tonnage of linters. Meanwhile, the government sells its available supply of linters. This sale, however, does not affect the possible production of a large annual tonnage of second-cut linters and hull shavings—a factor of decided interest to the paper industry.

Preparing cotton linters for manufacture into high-grade paper

Preliminary tests did not produce a satisfactory grade of white paper, the presence of tiny particles of hull fiber marring the finished product. Subsequent experiments have somewhat eliminated extraneous objects and the government is prepared to announce that the production of high-grade paper is possible from the utilization of cotton linters. The lint which is stripped from the cotton seed would replace low-grade rags as paper-making material.

Conditional upon the economic soundness of substituting third- and blue-grade cotton rags for linters, is based the development of the industry. Low grade rags are selling for $0.29 a pound, and computing the loss in conversion, the price of "thirds" and blue rags is approximately five cents a pound at the beater. Bleached cotton linters in wholesale quantities are being quoted at three cents a pound.

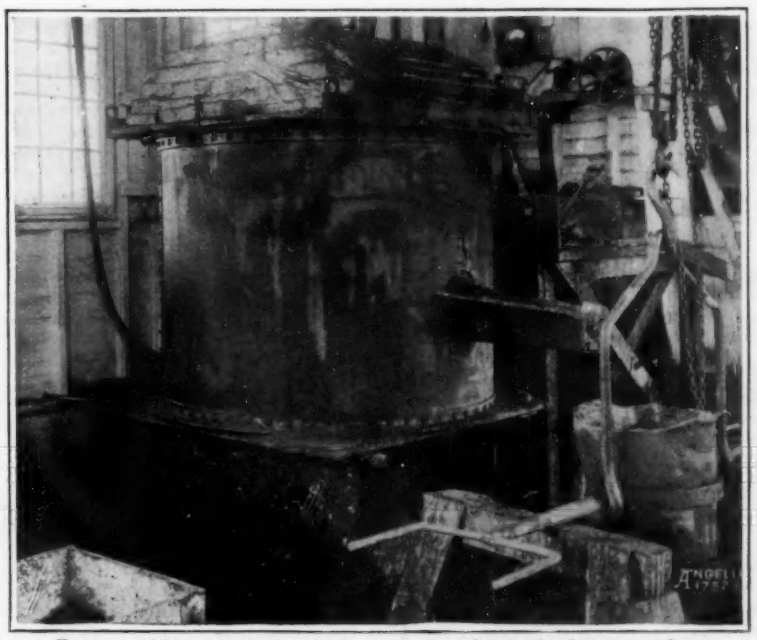
"While the problem is not definitely settled the samples submitted show that it is entirely possible to make a very good paper from this product," says the Bureau of Standards. "It is sufficiently encouraging so that actual mill tests have been and will in the future be attempted in many of our large paper-manufacturing plants. To date many of the runs have been only of mediocre satisfaction, but new developments in the line of linters seem to indicate that difficulties can be overcome, and that linters may be eventually a standard raw material."

The Interstate Cotton Seed Crushers' Association is interested in the development of the industry that would convert the linters into high-grade paper on a commercial scale. England manufactures paper from cottonseed hull fiber, and the Association is of the opinion that magazine and book paper manufactured from linters will soon be competing with the products obtained from high-grade rags.

Home consumption largely governs the volume of production of cotton linters. As a pre-war basis, the yearly production was 1,330,552 bales, approximately 915,552 bales being consumed by munition makers. Even before the crest of the world war was reached, Germany imported half a million bales annually from the United States for making explosives. Another half million bales were used by the mattress-manufacturers of this country. Limited uses are found in stuffing material for pads, cushions, comforts, horse collars and upholstery. Linters are likewise adapted to purposes of absorbent cotton, mixing with shoddy, mixing with wool batting, mixing with lamb's wool for fleece-lined underwear and felt.

Barely thirty years ago, the entire production of cotton-seed was discarded as the veriest waste. Today, the crude products from cotton-seed of an annual crop of 11,500,000 bales are valued at $413,540,000. However, the munition factory has heretofore consumed the bulk of cotton linters, the yearly production fluctuating with the varying demands for explosives. Therefore, when world peace is imminent and league treaties invite discussion, linters as material for war explosives receive a slump. Cotton ginners are so gaged as to obtain from 50 to 145 pounds of linters from the ton of cotton seed. Based on the "cut" of seventy-five pounds of linters to the ton of seed, the yearly production in the United States would approximate 1,500,000 bales—500 pounds to the bale—of linters.

Machinery for digesting paper pulp from cotton linters



Furnace with carbon bottom that converts steel scrap back into cast iron

Iron Castings from Steel Scrap

By A. R. Surface

THE usual method of making iron castings is to melt pig iron in a special type of furnace with coke, called a cupola. A company on the Pacific Coast has devised a unique electric furnace for this purpose, but pig iron is not used. Instead fine steel borings are used which are melted by electricity and then the requisite ingredients added to bring the product up to the composition of cast iron. A distinguishing feature of this furnace is that it has a bottom of carbon, that is, the melting takes place on carbon instead of on sand or magnesite as in most electric steel or iron furnaces.

The body of the furnace is a steel-plate shell, 60 inches in diameter, 48 inches high, lined with a mixture of coke and pitch. The roof is of fire brick. One electrode enters through the roof; the other is a cast-iron plate placed in the bottom of the furnace, covered with carbon as high as the tapping-out spout. The illustration at the foot of the page shows the general appearance of the furnace.

The furnace has a capacity of 500 pounds per charge of steel scrap, which is melted down and refined and then the necessary additions are made, such as ferrosilicon and carbon to procure whatever analysis one may desire to suit the product specified. The furnace is started at 7 A. M. and the heat promised at 9.30 A. M. and then every two hours the remainder of the day.

Using Brick and Wood in Reinforced Concrete

AN English engineer named Hodge, living in Guiana, has recently made some interesting experiments with regard to the substitution of brick for gravel in reinforced concrete, and wood for iron in the same material. Mr. Hodge's conclusions according to *Engineering* are as follows:

When the brick is of good quality it can be substituted without inconvenience where the cost of the stone is prohibitive. This view will be found of wide interest in many regions where clay for brickmaking is abundant, as in the devastated regions of the Somme and of Picardy, where suitable stone for making concrete is lacking. With regard to the second form of substitution—that of wood for iron—this engineer found that it was feasible if extremely hard wood is employed and if large sections are made use of. In this way he was able to obtain a material having only 10 per cent less resistance than that of ordinary reinforced concrete.

Naturally such substitution is not to be thought of in Europe or the United States, where hard woods are scarce and valuable. On the other hand it is a useful bit of knowledge for engineers in those tropical countries where excellent hard wood is more readily obtainable than iron.

Chilled-Iron Car Wheels

FOR over half a century the majority of the freight cars in use in the United States have been carried by chilled cast-iron wheels. These wheels have given general satisfaction even under the greatly increased stresses due to the heavy rolling stock now in use. It has been noted for several years, however, that failures of freight-car wheels occur quite frequently at the foot of long and steep grades. The cause of such failure appears to be the heating of the wheel produced by the prolonged application of the brake-shoes, this rise in temperature causing complicated stresses in the structure of the wheel. The stresses thus produced may be sufficient to cause cracking and failure and in all probability a derailment of the car under which the wheel is placed. In order to determine the exact temperatures in different portions of the wheel, after prolonged heating of the rim, the Bureau has instituted a complete investigation of this subject. It is obvious that temperature measurements cannot readily be made upon a wheel in service, and considerable ingenuity has been shown in perfecting a laboratory apparatus capable of producing conditions analogous to those met with on the road.

The Future of the Cotton Industry

What Organized Research Promises to Do for Grower and Manufacturer

By H. E. Howe, National Research Council

THE cotton industry, from start to finish, is in the habit of thinking wholly in large units. We speak of thousands of bales and thousands of yards, but we give practically no attention to the ultimate fiber upon which the entire cotton industry depends. Dr. N. A. Cobb in an excellent monograph published in 1915 calls attention to the importance of the cotton staple and particularly to the question of length and methods of determining this with accuracy. The loss due to the improper classification of cotton by length of staple probably constitutes one of our greatest unrecognized industrial wastes, and yet we are not making full use of scientific methods which would eliminate the personal factor to which much of the error may be due.

The strength of the yarn must be due to the physical qualities of the individual fiber, such as the twists in the fiber which increase the friction between fibers thus imparting greater textile strength to the yarn; and yet we know very little indeed concerning these twists, their significance, whether a variety of cotton can be identified by them, and how the cotton fiber should be manipulated to use this structure to the greatest advantage. What takes place in the fiber during the period when it matures? What is the effect of aging? What chemical changes does the wax undergo, and what effect does this have upon the quality of the fabric made from the fiber? What is the relative strength of the fiber in different parts of its length? When it breaks in the process of manufacture, where is this break most likely to occur and how can it be avoided? Is the slender terminal portion of the fiber as much weaker as it appears to be and is the more massive part where it is attached to the seed as much stronger as it looks? Can we control the separation of the fiber from the seed in such a way that it will part at the base of the fiber rather than break at some other point? Very few of those concerned with cotton have ever examined an entire fiber to obtain a real conception of what the fiber is, yet the whole industry depends on it.

True, we know that twist in the fiber is important, but that is about all. It would be important to know whether the degree of twist could be controlled in any practical way. How and when does the twist in the fiber arise? We know the fiber flattens out and takes on some of this twist during the ripening stage, but whether it develops slowly or rapidly and the effect of the time element in forming this twist upon the qualities of the fiber in terms of wear are not known. Further, we do not know how much the various kinds of cotton differ from each other in this respect, nor whether a given variety differs from time to time. It is doubtful whether anyone has ever compared all the fibers from one seed. If there is a difference, can this be altered by breeding? Is the difference one of length, of strength, twist, or taper?

Cotton Fiber and the Weather

To what is the difference in spinning qualities due and what is the effect of humidity? Does the very slight gain in length under certain conditions of moisture have an important bearing, and how humid can the fiber be without causing difficulties due to the shrinkage of the fiber? We have some data to show that the proper degree of humidity results in a marked increase in the tensile strength of the individual fibers, but no systematic use is made of this information in conditioning the cotton, in humidifying or conditioning the air in the mills, or indeed in locating the mills themselves. A buyer may have learned from experience that he can purchase cotton in the interior and have it gain fifty pounds per bale by storage at the seaboard due to the absorption of moisture, but as yet we do not know nearly enough about the effect of this moisture on the fiber when the work of spinning and weaving is undertaken; nor what the result will be when the fabric woven under standardized humidity conditions is taken to a drier atmosphere for use. Mill men know that sudden changes in atmospheric conditions have a direct effect upon their material in process and they sometimes say that it goes crazy, but if anyone will repeat Dr. Cobb's experiment with the cotton fiber, the straw and the covered tumblers of water and sulphuric acid, they will begin to understand why these fibers go crazy and why it would pay them to consult the Weather Bureau records, or indeed to have a special survey made before locating the mill, and to initiate a systematic study of the moisture.

From Cotton Plant to Cloth

What are the relations between the characteristics of the individual fibers and the qualities of the finished goods? What changes does the fiber undergo in the various mechanical and chemical processes? Can the final result be improved by modification of the processes or must we depend upon changing the fiber? If the fiber must be improved, in what direction would the manufacturer like to have the grower make such an improvement? If we knew all that we should about the changes that a fiber undergoes in each process, both mechanical and chemical, to which it is subjected, and understood what happens in the internal structure of the fiber, then we could specify the qualities in the fiber for which we should strive in producing it, and it would seem reasonable to expect the same success in growing fiber to specifications that we find in growing other plants. The florist grows his chrysanthemums for size, structure and color; he knows how to produce dwarfed plants and those which grow with unusual rapidity, and can even bring his flowers to bloom at a definite time. Agriculturists are also able to follow specifications in a large measure, and it seems reasonable to expect that the cotton grower could do the same if the manufacturer were able to gives specifications based on scientific data. Those interested in airplane cloths have done some work along this line, and the manufacturers of tires are active, having learned, for example, that a yarn having high tensile strength not due alone to excessive twisting is preferable for their uses. In this particular instance, then, the problem becomes whether there is a cotton fiber with characteristics such that the maximum tensile strength can be obtained with a minimum mechanical twist. The airplane experiments have indicated that cotton may possibly be made as strong as linen, and research in other fields has shown that it can be made nearly as warm as wool. Researches on napped goods in at least one instance indicated that properly napped cotton had 7/8 the insulating value of wool. Now if cotton could be produced with more resiliency so that this nap would not crush but would stand up as wool does, we would have gained a great deal. Such a resilient cotton could be used in the place of wool for batting, and when woven in fabric it might be resistant to creasing.

To manipulate cotton in a way to make it imitate certain other fibers is another broad field, and we have not yet fully solved the question of bleaching, especially of raw cotton on a large scale. Such a list could be extended indefinitely and, as is the case with all research, work begun upon a problem has a double advantage in that we not only gain knowledge but from our new viewpoint our vision is so extended that new problems appear, and we are better able to classify problems with regard to their importance, likelihood of early solution, and relation one to another.

Where Research Might Pursue the User of Cotton

Then there are a number of closely related interests. What attention has been paid to laundry practices by those interested in having cotton establish a reputation for serviceability? Research upon cotton should concern the proper use of the fabric after it has left the mill as well as its manufacture. Many believe that pure fabric laws should be enacted and that they would be of benefit second only to the pure food laws. It is important therefore that testing be standardized and that these studies be conduced in coöperation with the textile schools and the Bureau of Standards.

The question of buying cotton could very properly be studied by a research organization. Present market practices have a tendency to pull the whole industry down to the low level of inferior short-staple cotton, and no way has so far been found to make it worth while for the progressive cotton grower to be progressive. A research laboratory should be instrumental in creating a special interest among the growers and manufacturers to have better varieties of cotton produced, and its equipment should include semi-commercial-scale apparatus and machinery so that a new variety of cotton could be thoroughly tested and put through all the stages of manufacture under controlled and measurable conditions. This would greatly encourage the production of new, superior varieties and remove one of the present existing handicaps.

Consideration should also be given to the establishment of convenient conditioning houses where cotton could be accurately rated on the basis of measurable qualities and purchases governed accordingly, thus putting a premium on the uniform, clean, superior raw material. Too frequently progressive growers have found that their clean crop brought no more than the dirty, inferior crop of a less progressive neighbor.

The Means and Agents of Research

The cotton industry could not have reached its present state of development without drawing upon scientific and industrial research, and its further development will be held in abeyance until the factors of the industry come together upon some coöperative plan to undertake research upon the fundamental problems of the industry, these including the laws which govern the growth of the fiber, the properties of the fiber which have a direct bearing upon the quality of the finished product, the changes that occur in the fiber as it passes through the mechanical and chemical processes of the factory, and the laws which control the mechanical, physical and chemical operations to which the fiber is subjected.

The work as outlined, to be of the greatest help to the cotton industry, should be conducted by the industry itself. Individuals working alone have made some of the world's greatest discoveries, and great care should be taken to encourage individual effort, but individuals can coöperate and it is by this coöperation that the greatest results can be achieved in this case. The problems are too fundamental for any one concerned to carry on all the work profitably, but the community of interests is large and a plan can be formulated calling for an association of cotton growers, of ginners, spinners, weavers, finishers, printers, converters, wholesalers, bankers, transportation companies: in short, all those concerned with cotton: of a size that will call for but a small individual payment on the part of each, to conduct work so systematically and extensively that all will profit largely. It has been said that the investment made by Germany in research upon synthetic dyes has probably proved to be the best investment that has ever been made. There is every reason to believe that an investment in research on the part of the cotton industry will prove as remunerative. Such a research organization or association would not be called upon to duplicate facilities or equipment which exists in different parts of the country but it could articulate the work being done, minimize duplication, assign portions of the problems to those best fitted to solve them, enjoy and benefit from the work of the Government Bureau, the Agricultural Experiment Stations, and the Textile Schools, and act as intermediary between many branches of the industry. The laboratory of the research association, besides conducting various types of research, could conduct routine work, act as arbiter in case of dispute, consider questions of education with respect to the industry, exercise a good influence in preparing operatives and others to utilize the advanced knowledge which the association would help to obtain.

SOME weeks ago we published a discussion by Mr. Howe of the role which research has already played in the cotton industry. This article made it clear that a goodly share of the present prosperity of the cotton grower and the manufacturer who handles his product is owed to the work of the chemist. But chemistry's benefit to the cotton industry by no means lies altogether in the past; there are many problems which have been touched hardly or not at all. In the present story Mr. Howe forecasts some of the results which the cotton people may still hope to achieve with the aid of the chemist and the laboratory worker in general, and makes it plain that the scientific development of the industry holds forth great prospects.—THE EDITOR.

Correspondence

The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.

About that Pendulum

To the Editor of the SCIENTIFIC AMERICAN:

In your issue for February 7th there is an article "Why Does the Clock Keep Time," in connection with the illustration for which there is made the statement: "Time is measured by the length of the arc—the length of the arc by the length of the pendulum."

If this means what it seems to me to mean, I believe it to be a misstatement, because the length of the arc has nothing to do with the time of vibration, or period, of the pendulum. The usual expression for the time of a complete vibration of a pendulum is given by the equation $t^2 = 2\pi \frac{l}{g}$ and this shows that the time is independent of the arc or angle through which the pendulum swings.

I notice that the old difficulty in naming the swing of the pendulum still exists. Why should we have to speak of it as an oscillation or vibration? At present we say a single swing, a single vibration, a double swing, a complete vibration, or even a swing-swing. Why not call a swing once over the path a vibration, and a swing twice over its path an oscillation, thus ending the confusion once for all?

GEO. A. HOADLEY.

Swarthmore, Pa.

[*Mr. Hoadley is of course right in his criticism—one which a number of our readers have been kind enough to make. The fact that the contributor of this article made two errors in arriving at a correct conclusion camouflaged these errors to the editorial eye when we read his manuscript and examined his drawing with its legends, 'Time is measured by the length of the pendulum,' and if the objectionable statement be read in toto, it will be seen to say this. That the two misstatements with regard to the arc summed up to a correct statement about the pendulum led us to overlook entirely the unwarrantable mention of the arc. The arc, of course, has nothing whatever to do with it, and should not be mentioned in the discussion.*—THE EDITOR.]

Are Martians People?

To the Editor of the SCIENTIFIC AMERICAN:

The idea of "communicating" with the Martians is apparently irrepressible, but it does no harm to revert to sanity on this subject once in a while, as "W. L. B." has done in your correspondence column of March 6.

Nearly twenty years ago I published in the *Monthly Weather Review* (December, 1900, p. 537) some suggestions bearing on this question. The following paragraphs may be worth reprinting:

It is strange that no one has ever pointed out how unphilosophical, from a biological point of view, is the question, "Are there people on Mars?"

In the writings of many latter-day *littérateurs* and not a few professed scientists we find glib references to the "people" of this or that planet, and the use of this word implies the assumption that life, from its necessarily simple beginnings, has, in each world where it exists, ultimately developed one and only one species more or less like the human race, and clearly differentiated from and superior to all the other species produced in the same world. But nothing that we know of the evolutionary process warrants such an assumption.

The imaginable forms which living matter may assume are infinitely diverse. Look forth upon the myriad species of organic beings—plants and animals—which our own world contains. Where among them all can you find an organism, other than man, which, if placed upon Mars, would be intellectually capable of communicating with us? What success should we have in attempting to telegraph to a race of horses or guinea-pigs, for example?

On our own planet the development of life apparently entered, at an early stage, upon two diverse roads. The forms subsequently evolved, though probably of common ancestry, are nevertheless clearly and naturally divided into two great kingdoms, the animal and the vegetal. But there is no reason for supposing that the course of events has been the same in other worlds than ours. For example, it may be that on Mars plant life only exists. Now, suppose that, as the speculators on this subject commonly assume, Mars has supported life longer than the earth. In such a case the plant forms would presumably have reached a high stage of development; plants would there exist compared with which our highest plants, such as daisies and asters, are simple and rudimentary. Nevertheless, it is not conceivable that any plant, however high in the scale, could hold communication with the human race.

However, I think it is most reasonable to suppose that, if life has been produced at all upon other planets than our own, it has assumed forms of which we know nothing; forms which may be neither animal nor vegetal, which transcend our experience, and of which we are therefore quite unable to conceive. Given life, plastic and protean, and the laws of probabilities, and such a result would seem to follow as a matter of course.

Even could we actually perform the journey to Mars, it is not likely that we should be able to communicate with its inhabitants, and if we found existing there a great number of life forms we should probably have difficulty in deciding to which of them, if any, the designation "people" should be applied.

C. FITZHUGH TALMAN.

Washington.

The Life Gun on the Ship?

To the Editor of the SCIENTIFIC AMERICAN:

I was much interested in the graphic illustration on the outside of your issue for January 31st, showing the operation of the life line sent out to a vessel in distress. For many years it has seemed to me that a great deal of property and many lives might be saved if the mortars to fire the lines were carried on board the vessels instead of operating from the shore. Hundreds of times the line fails to reach the vessel in distress, having a comparatively small target and firing against the wind. If by law coastwise vessels were obliged to carry provisions for firing life lines, they would be sure to reach the target, as they couldn't miss the shore, and aided by the wind blowing directly towards the coast as is usually the case in such disasters. With signalling devices to call the attention of the coast-guard to the position where the line falls there would be direct communication between the shore and the vessel, which would be most desirable and would expedite the further life saving operations. To fit out vessels with such apparatus would not be very expensive, and the cost might fairly be obligatory on vessel owners. There may be some reason why such arrangements have not been carried into effect, but I do not know what they are. It occurs to me that it is worth consideration, and I thoroughly believe the principle is a correct one.

GEORGE H. TRIPP.

New Bedford, Mass.

The Bartram Oak

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of October 25th there appears an article on page 422, "The Story of the Bartram Oak." In this there appears to be some doubt as to the origin of this oak. This section of the country abounds in such oaks as you illustrate and describe.

From time immemorial so far as the history of the South is concerned it has been a story handed down from father to son that this is a cross between a willow oak and the red oak. That it is a hybrid is evidenced by the fact that seedlings from the same tree will possess different leaf shapes, in most instances different from the leaf shape of either of the parent trees. I know one city public square in this section set with two dozen such oaks taken from the forest in one small area and probably seeded from the same tree and with the exception of two, each tree bears a leaf-shape distinctly its own and each different from the other, yet the two exceptions appear to be true willow oak.

This tree produces the most magnificent and symmetrical tree for ornamentation and shade of any tree in this section and frequently the green foliage remains on the tree throughout the winter and until displaced by the foliage of the following spring and for that reason is placed in the live oak family.

R. W. ADAMSON.

Carrollton, Ga.

Electric Welding

To the Editor of the SCIENTIFIC AMERICAN:

I was much interested in reading a letter in the SCIENTIFIC AMERICAN for September 13th, 1919, by Mr. P. J. Swanson, describing an electric weld which this gentleman states he made on a broken crank shaft of a 4,000 horse-power steam engine of "a boat running between Seattle and Tacoma; it being the fastest boat on Puget Sound."

Your correspondent does not mention the name of this boat but the job seems to correspond in description to one performed by the same gentleman and which the writer recently had the opportunity to inspect.

This job was done on the steamship "Tacoma." When this shaft broke it was fractured in such a place as to necessitate taking it out of the boat if it were to be welded with thermit. There was an inspector of the Government there, however, who recommended electric welding. The shaft was welded with a portable welding machine without any guarantee. Some reinforcements of the narrow side of the web were welded. That was the only part that held or showed to hold anything. The shaft lasted six months. When it was removed from the boat it was completely broken apart.

The port engineer of the steamboat company invited the writer to look at the shaft about the middle of September. It was then lying on the dock. It could be plainly seen that the electric weld was simply laid on. Of course it was a failure pure and simple.

This kind of work has a tendency to tear down rather than build up the welding business and we think a man who undertakes to do a job of that kind is lacking in experience. GEO. H. RICHARD.

Seattle, Wash.

The Scientific American Monthly for March

DO Calories Measure the Value of Food? This question is asked by Dr. Henry Dwight Chapin, M.D., who arrives at the conclusion that heat measurement alone is not a safe guide for the calculation of food values. Foods that build rather than those that readily undergo oxidation must be properly gaged if we are to have healthy development. Some form of biologic testing of foods must be elaborated if an always reliable gage of nutrition is to be established.

Under the title "Paradoxical Windwheels and Soaring Birds," Thomas O. Perry describes some interesting experiments with windwheels which are driven clockwise or anti-clockwise without any alteration either in construction, position or other conditions. A rotary thrust is produced without any weather angle. From these experiments he deduces a theory to account for the soaring flight of birds in horizontal winds with no rising currents of air.

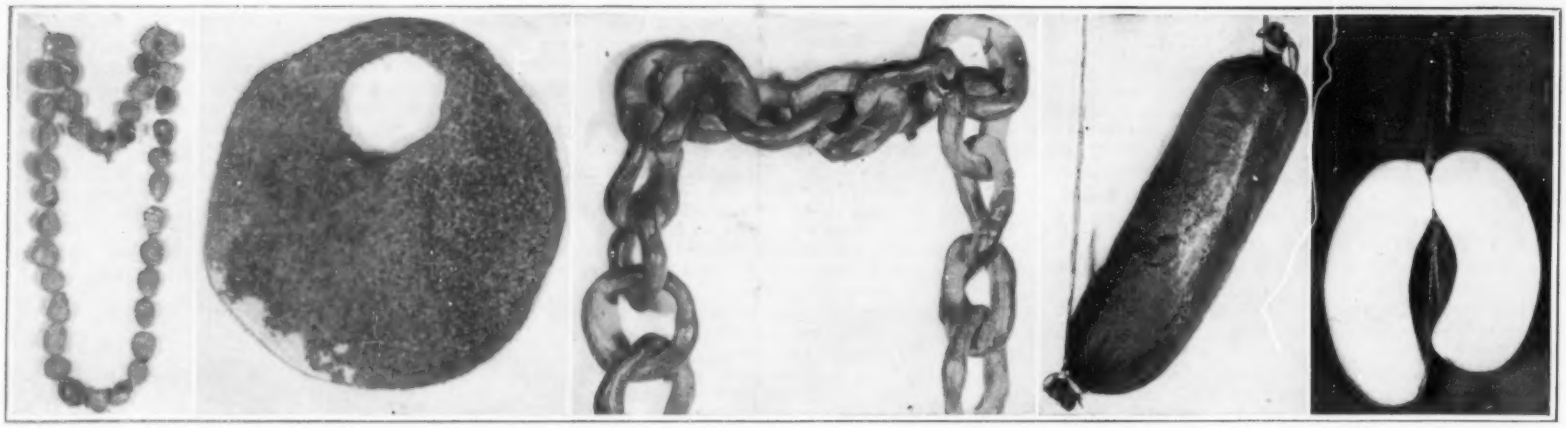
A very interesting study of the flight of insects, and particularly of their methods of steering while in flight, is given by Dr. F. Stellwaag of the University of Erlangen. He has photographed the shadows of flying insects and arrives at the conclusion that they perceive disturbances of equilibrium and return to the position of equilibrium by means of "pressure steering" rather than "weight steering." By "weight steering" he means a shift in the center of gravity due to a change in position of some member or part of the insect in the same way that an airship is steered by means of a sliding weight, whereas "pressure steering" means a change in the center of pressure which has its analogy in airplanes and airships in the shifting of a rudder.

Do animals ever use artificially improved tools? Under this head is described the work of certain ants which use their larvae to spin a web for them. While the larvae serve as spindles and weavers shuttles, they cannot be looked upon as artificially improved tools. However, one or two examples are given of animals that do improve the tools with which they work.

An investigation was recently conducted in the Massachusetts Institute of Technology to determine the cause and nature of the transmission of metal from an electrode to a plate. The conclusion is reached that the metal is projected from the electrode by suddenly formed vapors. This new theory of metallic arc welding is described by Ralph G. Hudson.

"Fatigue Phenomena in Metals" gives a summary of available facts and theories relating to fatigue failure together with a discussion of some unsolved problems. Under the title "Non-Rolling Passenger Liners," Edward A. Sperry, well known for his work with the gyroscope, describes what he terms the "Pullman service of the sea," and shows how a gyroscope is able to keep a large vessel from rolling. He combats the claim that a vessel must roll in order to avoid injurious strains, and tells of vessels which creak and groan in a heavy seaway but run absolutely without noise when the stabilizer is set into operation.

Professor William A. Bone and P. St. G. Kirke describe methods of firing steam boilers without flame and describe recent developments in surface combustion boilers. There are twenty-five articles in this issue, aside from the regular departments dealing with various fields of engineering and science and a score of short items and notes.



From left to right: hazel nuts strung on a string, from Italy: Turkish small-bread covered with poppy seed: chain bread from the Black Sea regions: chocolate paste in Bologna form: Italian lard in sausage skins

A few of Manhattan's foods that are strangers to the native-born population

Strange Things to Eat

Some Random Selections from the Cosmopolitan Larder of New York, City of All Nations

By L. Lodian

MANY regions of the earth are populated by races which make a large part of their diet of meat and meat products; but again we find large tracts in which the chief human food consists of vegetable products—seeds, flowers and bulbs. Especially in certain sections of Europe and Asia is this tendency calculated to impress the traveler; and many of the items which thus serve for human substance seem to us queer provender indeed.

The *möhn* of Teutonic lands, for instance, is a poppy-seed-covered foodstuff which is very nearly whole seed—that is, the poppy seed has not been crushed or milled in any form, but has been merely lightly pressed or rolled into the sweet dough, and then put through the oven. The poppy seed has been so liberally and densely scattered over the surfaces (both sides) of the *möhn* that the background or cereal substance underneath is never visible. This is much used by the Central European colonies in Manhattan as a semi-dessert, of high nutritive value. It is baked in large sheets about the size of the ordinary desk blotter, and one centimeter thick.

Of all seed foods this is the most mystifying to the casual visitor to the city's exotic colonies. You can roll it up and send it through the mails as you would a sheet of music.

Another seed food fairly well known is the levantine confection known as *halva*. This is just a compound of sesame seed and sugar—though of recent years maize sugar has been substituted for cane. It is of melt-in-the-mouth delectability, and is the most sustaining confection that I know; so heating is it that its use during warm weather is almost taboo. *Halva* is in use from the Mediterranean overland to the Pacific—in fact, no other confection of the globe has the universality for which this substance is so well known.

An American-made *halva* is sometimes compounded with cacao powder. The levantine article is likewise often mixed with the choice little pistachio and pinyon nuts. These are always on sale in Manhattan.

Many other Asiatic small breads, baked fresh daily, are hidden under a thick coating of sesame seeds. The flavor is that of a tasty bread-and-bacon sandwich. These seed breads, in Manhattan, will be found much in daily use by a curious foreign colony of the ghetto known as the "lost tribe." Expelled from Spain as a menace to the state some four centuries ago, they settled in the Levant. In the course of the past three decades many thousands of them have been gradually penetrating to Manhattan. Here they have their own daily newspaper; and all through these centuries they have remained faithful to the Spanish language, which they speak as fluently as their acquired Arabic. Yet they remain clannish and keep to themselves so that not even the old Spanish residents in New York are apt to know of the existence in the city of some score of thousands of their colinguists.

An interesting colony, this *triba perdida*. Among them you find the lentil-seed biscuit; likewise the fragrant rose marmalade, of rose leaves and wild honey, the opening of a container of which makes a room odoriferous from the bouquet of the large white damask blossoms. Rose marmalade is a choice tid-bit between slices of thin bread and sweet butter. It is imported in five- and 28-pound containers; and even through the war the lost tribe was able to obtain supplies from the Arabic countries kept "open" by the French and British—as Morocco, Algeria and the Nile region.

The use of flowers in the preparation of perfumed soft drinks by these near-easters is on an enormous scale. Their essences of rose, violet, jasmine, et al., are a tribute to the race.

Water-lily bulbs make the blanc-mange desserts of the oriental table. These are really nothing but a form of the so-styled water chestnut. They have been used for food since antiquity. Their nutritive value compares with that of tapioca,

(Continued on page 312)

Chestnut flour from Italy, and the husked nuts as milled by the ton

The well known Irish dulse, or edible sea-weed

Oriental ripened eggs, matured in earth; one is shown opened, black throughout to the yolk

Water-lily bulbs and package of flour therefrom, used in the Levant for blanc-mange desserts

Trees That Are Older than History

SUPPOSE that one fine morning you read in your morning paper that a camping party had found, in the mountains in New Jersey, a valley in which there were mammoths and the gigantic old-world lizards still alive—beyond a doubt, and to be seen by anybody who cared to go there. You would consider it a wonderful thing, would you not, that these strange creatures had survived in that spot to the present day?

In the vegetable kingdom there are such survivals to be seen. On the western slopes of the Sierras of central California grow the contemporaries of the mammoth and dinosaur, in the shape of the sequoias or "big-trees." These are the survivors of an ancient race that grew thousands of years ago, and were almost all destroyed by the glacial period, which covered the continent with ice and snow.

This survivor of an ancient race is probably a thousand years old

This log was taken from a tree 1,300 years old. It is 16½ feet in diameter and weighs 9 tons

Two species, the redwood and the sequoia or big-tree, which happened to be growing on the warmest slopes of the mountains, were able to bridge over the ice period. There, and nowhere else in the world, the remnant of an ancient race still stands.

They are godlike among trees both for their size and the length of their life. They tower 400 feet into the air, and can live for 5,000 years—perhaps longer.

The great section of wood that forms the subject of one of our illustrations, is in the American Museum of Natural History. It is 16½ feet in diameter and weighs 9 tons. This great tree was cut when it was still comparatively young. It was 1,400 years old at the time. It sprouted in its undiscovered mountain wilderness about A. D. 500, when the Roman empire had only just come to an end. It was a good-sized tree in the reign of Alfred the Great, and by the time America was discovered it was nearly a thousand years old.

There are thirty-one large and small groves of big-trees in existence, covering, altogether, about fifty square miles. With few exceptions they are in the National Forests of California, where they are protected by the Government from destruction by fire, irrespective of ownership. No Government-owned big trees are being cut.—By *Sidney J. Hall.*

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This piece of copper, with the outline of South America, was found in that shape

South America in Natural Copper

IT is perfectly obvious at a glance that the accompanying piece of copper represents the outline of South America. And the truth of the matter is that this piece of copper was taken from a mine in Bolivia in exactly that shape, with the single exception of the outline of Bolivia which was worked out in silver. This strange piece of copper was recently presented to the Smithsonian Institution by the Republic of Bolivia.

French Flameless Gunpowder

SOMETHING of the methods adopted by the French as the result of an investigation set on foot in 1906 for the suppression of the flame normally caused by the explosion of the propellant used in firing a gun are now made public. The aim was, of course, to attain the desired end without reducing the power of the powder. This was, however, found to be impossible. After many substances had been tried—cellulose (both from cotton and from wood), naphthalene, mononitro-naphthaline, trinitroxylene (xylite), powdered charcoal, vaseline, and others—vaseline was found to be, upon the whole, the most successful. The only material which approached vaseline in applicability and effectiveness was hydrocellulose in the form of fine powder. In the famous 75-milimeter gun the charge of propellant—B.S.P.—was increased by 4 per cent to counteract the diluting effect of the vaseline used, which amounted to 3 per cent of the powder. For the 105-millimeter and larger guns the vaseline equalled 6.5 per cent, while the weight of the powder was increased by 6 to 8 per cent. Vaseline has always been an ingredient of the British propellent, cordite.

Repairing Walls with Atomized Concrete

A NEW method of repairing sea and other stone and concrete walls, the invention of Harold P. Brown of New York City, has been put into successful operation. It involves mixing cementitious material containing sand, stone and cement in a mixer drum by a series of rotating blades, from which drum the concrete passes through an outlet opening, and a blast of steam or superheated steam is introduced into the chamber to atomize the plastic ingredients, the concrete being carried on by the steam into a delivery conduit, in a creamy state. In this state it is sprayed onto the walls to be repaired, forming a complete and effective waterproof coating such as is effective in repairing sea walls, relining tunnels, and levees, where it would be exceedingly difficult to apply the concrete by hand without an excessive amount of labor.—By *L. L. Sargent.*

The Telephone as a Water-flow Gage

SPRING and early summer come once each year to nearly every part of the temperate zone represented in our U. S. A. (I have allowed room for exception, for in Chicago we usually are deprived of our springtime and pass with a quick transition from winter to summer!) Each said spring or summer, the time varying with the latitude and the contour and forestation of the land, brings with it the probability of a flood condition derived from melting snows, the rains of the equinox, the April showers made famous by the poets, or the sudden and torrential cloudbursts of some mountain regions. And about "once in so often."—though we rarely know how often or in just what year it will happen near us,—an exceptional liquidation of the landscape surpasses all records within a generation.

When the floods rage, as they will do in excess somewhere each year, will we be ready? Then, if never before, will be tested our foresight in the designing of adequate culvert openings; our wisdom in planning and honestly building of good materials with sound workmanship our highways, bridges, dams, dikes or levees to guard an immense acreage of low-lying, fertile fields. Then, unless our engineers have arranged a safe run-off for floods, we may have inundated homes, floating barns, drowned livestock, or be lucky if we, ourselves reach *terra firma.* Dayton has done much to control future floods. Denver hopes never again to see Cherry Creek claim portions of the city for its bed.

As a scientific basis for new structures or the strengthening of old ones an accurate knowledge of a stream's velocity is of importance. A record of the average speed of each stream under varying conditions can be made ready in advance of need. Guesswork in times of low water is of little value. In seasons of flood the casual observer standing upon the bank and watching trees float by or bridge supports undermined tends to overestimate the speed of the

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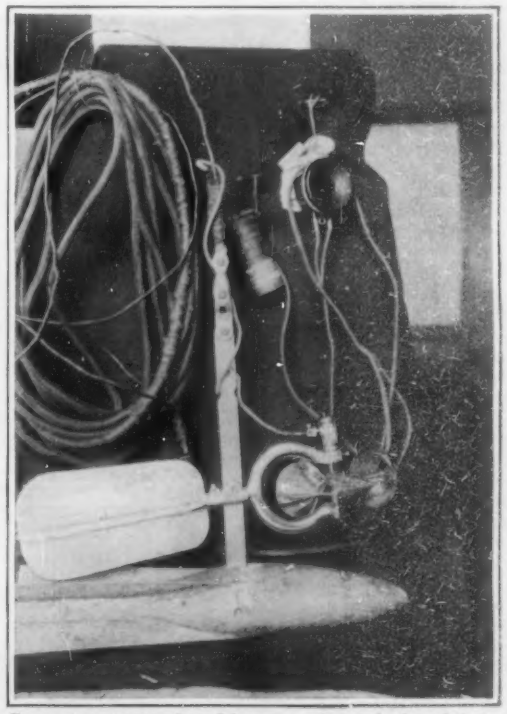

Current meter employed in measuring velocity of rivers and creeks in Iowa

Driving the 14,000 piles to support the 325,000-ton weight of the shiplock being built at New Orleans. The floor of the lock is being laid about 40 feet below the piles visible in this view. This lock is costing $7,321,524.

View of the siphon at New Orleans. Note the 110-foot opening for ships to pass through, when the ends of the Industrial Canal are connected up. The siphon drops 46 feet and carries the city's drainage under the canal.

Two views of the construction activities on the New Orleans Industrial Canal, which cuts the distance to the Gulf in half

New Orleans' Industrial Canal

A Six-Mile Waterway Connecting the Mississippi with the Gulf

By Thomas Ewing Dabney

NEW ORLEANS has for more than a century been planning to build a ship canal to connect the Mississippi River with the Gulf. It would cut the distance to the Gulf in half, would enable cheaper wharf construction, and furnish a fixed-level waterway for the development of industries.

New Orleans finally began the work in May, 1918. The immediate cause was the Government's call for ships, more ships, yet more ships. Two yards were begun along the right of way of the canal before actual work on the latter had itself got started. Both have launched ships—the largest built in the South. Both are building ships.

But the real reason why New Orleans entered upon an enterprise for which the State authorized a bond issue of $25,000,000 was that the people of New Orleans felt a greater confidence in themselves and their city than ever before; and taught by the war to think in greater terms and to dare greater things, entered upon this huge work of progress.

The Board of Port Commissioners of New Orleans, a state body, is building the Industrial Canal or Inner Harbor as it is called. The bonds are guaranteed by the state of Louisiana; the interest by the Levee Board and the Public Belt Railway of New Orleans. The George W. Goethals organization of New York, consulting engineers, have charge of the work.

Twelve million dollars have been spent on the work to date. The job is about 85 per cent complete, though the character of what remains to be done is such that the Canal cannot be finished before the middle of 1921. If the money now available is sufficient to finish the canal, the cost will be $19,000,000—leaving $6,000,000 for future development, and the extension of the facilities through the construction of lateral slips.

The Industrial Canal when completed will be 300 feet wide, 30 feet deep and six miles long. Twenty-six feet deep now and reaching from the lake to the lock-site, just half a mile from the river, the canal itself is nearly finished. The building of the lock is the big work ahead. This is an engineering problem relatively more hazardous than the Panama Canal locks, according to engineers on both big jobs. Soil conditions thought unconquerable had to be met.

This region of Louisiana is underlaid by quicksands and natural gas. The threefold pressure of the earth, the river and gas forces the sands into the cut wherever a deep excavation is made. The deeper the excavation, the greater the flow of sand.

To accommodate modern tonnage, a lock had to be designed 1020 feet long, 150 feet wide, and 68 feet deep. The floor of the lock had to be laid 45 feet below the surface of the ground. Such an excavation had never been made in this region. Many engineers said it was impossible—or could only be done at a cost that would frighten the Government.

Goethals began an excavation 1500 feet long by 750 feet wide. He sloped the cut towards the center gradually, to prevent slides. At the beginning of the cut, he drove a ring of sheet piling, to stop the flow of the first stratum of quicksands. A hundred and fifty feet farther in, he drove another ring of sheet piling, to stop the flow of the second stratum of quicksands. Then he addressed himself to the serious task of sinking the excavation for the lock itself.

Ground conditions proved more difficult than had been anticipated. The sides of the excavation began to cave in, the quicksands ran through the cracks in the sheet piling as fast as the dredge could pump them out, and the gas pressure threatened to blow in the bottom.

Thirty feet of water was pumped into the excavation. Its weight balanced the pressures. This was in May, 1919. Then a number of 10-inch artesian wells with gravel filters to hold back quicksands, were driven to relieve the gas pressure; a ring of steel sheet piling was put down, and a remarkable series of braces, composed of 10-inch timbers running in both directions, was constructed to hold the steel piling in place. On top of these braces the pile drivers were erected, and they proceeded to drive the 14,000 60-foot foundation piles into the water, as deep as they could.

In January, 1920, the lock site was unwatered very gradually. A corps of engineers and experts watched every timber. Everything held; the gas pressure was relieved, the flow of quicksands stopped; the problem was solved!

Piledrivers are now following down the foundation piles, and the work of pouring the 100,000 yards of concrete that will be needed to build the lock, begun. Three railroad trestles have been thrown over the lock site, and over them the concrete trains pass, dropping their four cubic yards each. It is estimated that the concrete will be put in at the average rate of 400 cubic yards a day.

The floor of the lock will be 10-12 feet thick, and laid in 15-foot sections, because only a few of the braces can be removed at a time. The walls will be 13 feet thick at the bottom, sloping to a thickness of

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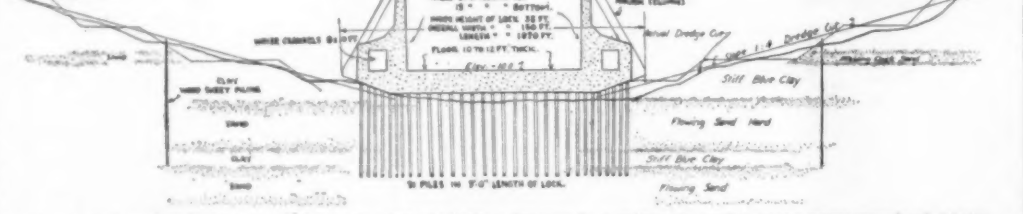
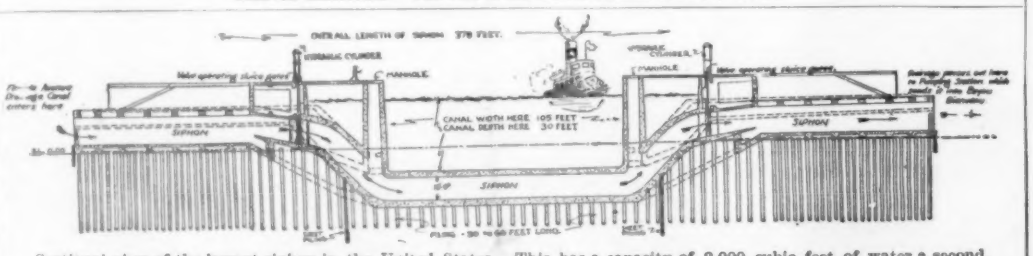
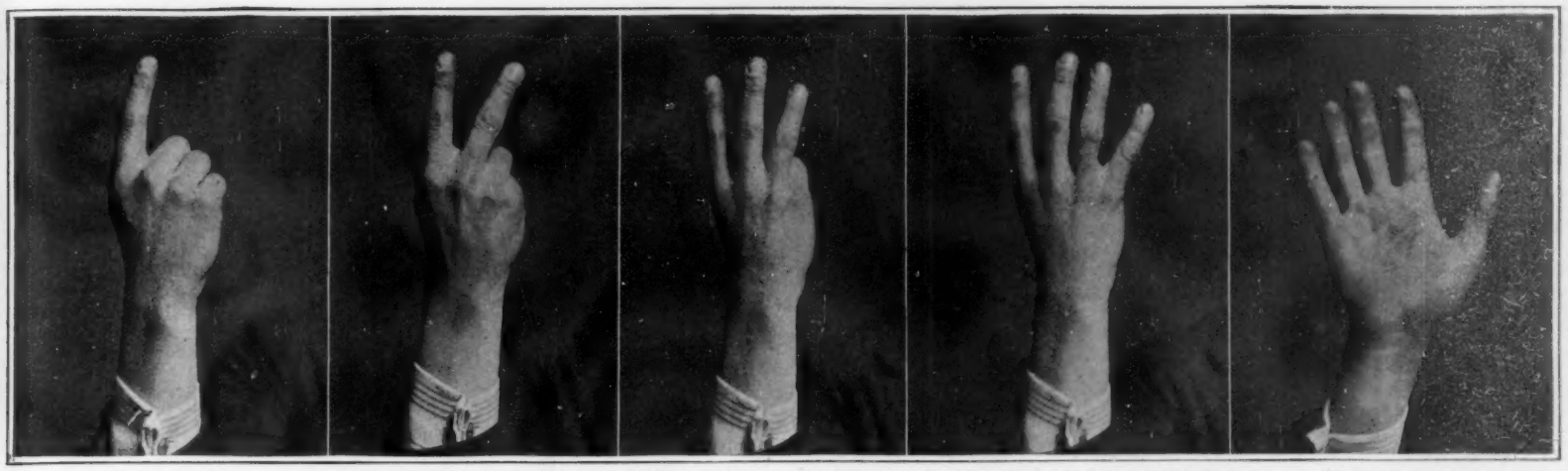


Cross section, showing details of the work, of the lock New Orleans is building to enable ocean-going vessels of 10,000 tons to pass direct from the Mississippi River to Lake Pontchartrain. It represents the solution of a soil condition believed unsolvable. The cost of the lock is estimated at $7,321,524.



Sectional view of the largest siphon in the United States. This has a capacity of 2,000 cubic feet of water a second, and will take the entire New Orleans sewage underneath the ship canal, 30 feet deep, with which New Orleans is connecting Lake Pontchartrain and the Mississippi River. The cost of this siphon was $620,000, and it was a year and a half in building.

Some details of the New Orleans Industrial Canal connecting the Mississippi with Lake Pontchartrain



"You have a flat shoe." | "You had better stop and inspect your car." | "Am I on the best and shortest road to next town?" | "Danger ahead." R.R. Crossing, bad road, dangerous turn, etc. | "Stop! I need your assistance."

The motorists' five-finger signal code at a glance

Finger Signals for the Motorist

By Robert G. Skerrett

LAST year the reckless and incompetent handling of automobiles in a single State exacted a toll of 1,287 lives, and thousands of persons were more or less grievously injured besides. It is likewise true that a lack of knowledge of conditions, an ignorance of the state of the road ahead, and a failure of one driver to caution another had much to do with numerous accidents and the destruction or loss of an immense amount of property throughout the length and breadth of the land traversed by motor trucks and automobiles.

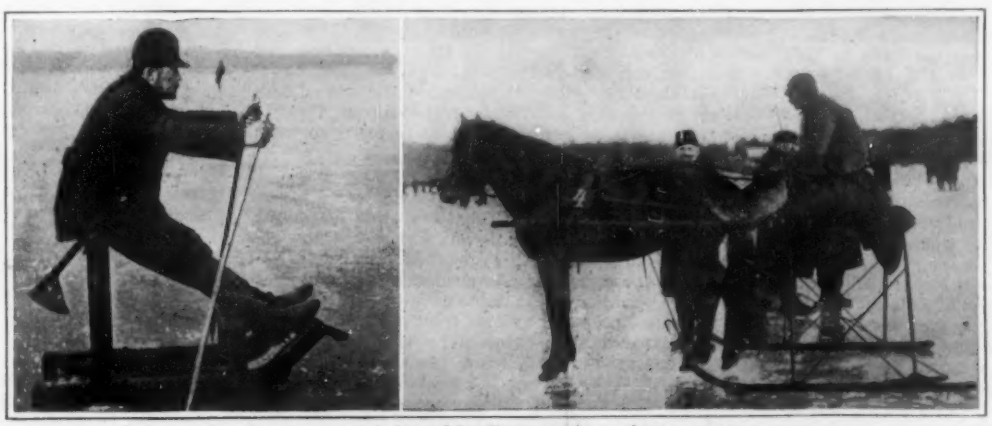
The continually augmenting number of machines and licensed drivers, and our over-widening dependence upon automotive vehicles make it imperative that we find some media by which needless sacrifices of life, limb, and material can be reduced. Dr. Theron W. Kilmer, a physician in New York City, has suggested that much may be gained in this direction by facilitating intercommunication between the drivers of speeding cars. He is convinced that a word of warning at the right time will be of the greatest benefit, and to this end he has evolved what he is pleased to term a "five-finger exercise for the motorist." To be brief, he has proposed a sign language of five signals in which a display of from one to five fingers makes it practicable for the man at the wheel to signal useful information or to ask another motorist a question which may save much time and trouble.

The code is merely an amplification of the one-arm semaphore by which a driver now indicates that he is about to turn out of line and thus cautions the man behind him to slow up. As the illustrations show, the Kilmer signals are all made with the fore arm held upright and the hand so placed that the fingers will receive a full measure of light or stand out well silhouetted against a luminous background. Dr. Kilmer has chosen this position as the one likeliest to prevent confusion. As an experienced motorist, he knows how much the other fellow hates to be halted, particularly if he is not to be the gainer; and his desire has been to produce a code of such simplicity that "he that runs may read."

The display of a single finger means "You have a flat shoe"; two fingers warns the approaching or passing car that something is wrong with it, in short, that the machine should be stopped and inspected; three fingers is the query, "Am I on the right road to the next town?"; a spread of four fingers is the symbol for danger ahead; and when five fingers are shown the oncoming motorist is asked to stop and to lend assistance.

A flat shoe is not a trifling matter. In ignorance of it, a driver may ruin a tire; and the records show that numerous grave accidents have resulted from this wheel defect. Something may be loose or about to drop from a passing car which may entail either loss of property or invite disaster. Prompt inspection will save a tool box or, perhaps, prevent a wreck. Time and again the autoing stranger has gone miles astray on the wrong road when a nod or a shake of the head from someone informed might have reassured him, if on the right path, or brought him around and into the desired highway to the next town. A danger ahead may be an unsuspected railroad crossing, a sharp turn, a wreck, or an impassable or very bad road. A signal to that effect would cause the driver to slow down and to find out what lies before him. Every decent driver will respond to a rightful call for help, but he naturally wants to be certain that it is necessary that he should stop. These signals are easily memorized and readily made; and Dr. Kilmer urges that every licensed driver be required to know them.

Twin-fuselage tandem-engined Thomas-Morse mail-carrying plane which transports 1,500 pounds of mail at 130 miles an hour



Two types of sled used by Germans for racing purposes

Breaking Away from the Conventional in Mail Airplanes

WHAT appears to be a move in the direction of obtaining greater reliability in mail airplanes is presented in the new Thomas-Morse transcontinental biplane recently tested by the Postoffice Department officials at Ithaca, N. Y. This machine, which is shown in the accompanying illustration, is intended for the aerial mail route between Omaha and San Francisco. It is designed to carry 1,500 pounds of mail at a speed of 130 miles an hour.

A close study of the illustration reveals the unconventional character of this machine. It will be noted that the central nacelle contains two engines, one for the tractor screw and the other for the propeller screw. The engines are so arranged that they can be inspected and repaired while in flight.

The Barytes Situation

THE greatly increased use of lithopone as a base for paints, particularly for interior use, has stimulated the demand for barytes to such a degree that the supply cannot keep pace with the demand. Lithopone is an artificially prepared compound composed of about 70 per cent barium sulphate and 30 per cent zinc sulphide, precipitated together. Its most important use is in paint, but it is also used in oilcloth, linoleum, rubber goods, shade cloth, etc.

New Ice Sports for a Hard Winter

THE severity of this winter appears to be more or less universal with the result that the world at large has witnessed winter sports on a truly colossal scale. One instance will suffice. There has been considerable skiing this winter on Manhattan Island—the very heart of Greater New York—where heretofore skiis were generally known as interesting exhibits in museums and sporting goods shops.

From Germany come the two interesting illustrations at the bottom of this page. The Germans, too, have taken advantage of the severity of the winter by holding all kinds of tournaments and fostering winter sports in general. The first illustration depicts a queer type of sled which is propelled by a pair of spiked poles. The contestants push their sleds along by such means. The second illustration shows a horse-drawn sled of extremely light construction, which is used for racing purposes.

The Service of the Chemist

A Department Devoted to Progress in the Field of Applied Chemistry

Conducted by H. E. HOWE, Chemical Engineer

Cyanide Bath in Place of Case-Hardening

THERE have been times when cyanides were very costly and this has led to the development of a substitute for case-hardening which has given satisfaction on a commercial scale over a period long enough to prove its success. Calcium cyanamide in a bath of easily fusible salts is the new reagent invented by Porter W. Shimer.

The usual practice is to employ sodium or potassium cyanide as such or in a mixture designed to lower the melting point of the fused bath. Articles to be case-hardened are immersed in the bath where carbon is taken on in the thin metal skin of the article after which it is quenched in a suitable cooling liquid. Great care in ventilation must be exercised as the fumes from the bath are poisonous, cyanide being one of the most deadly inorganic poisons.

The new bath gives off no poisonous vapors, is said to be equally effective as a hardening agent, and costs less. A bath is first prepared by fusing sodium, calcium and barium chlorides or some similar mixture which does not seem to be fixed either as to substances or their proportions. Selected lumps of cyanamid, which has been kept from air since being taken from the furnace, are now added preferably in a basket. Gas is evolved at once and so long as gas is given off the bath possesses case-hardening properties. This gas acts as a stirring agent, aids in securing uniform heating and always indicates whether the bath is in good working order. The amount of cyanamid required is reported as 5 per cent of the weight of the bath and where fresh lumps are not available a coke made by mixing powdered cyanamid with hard pitch or tar and coking at a red heat may be used.

The scientific basis for the procedure, which is patented, is not understood and the reactions are no doubt complex. The gas given off has not been identified. These phases of the invention are under investigation. Meanwhile satisfactory case-hardening is going on with greater safety and less expense.

Industrial Stand-Stills

HAVE you ever considered how many industries have gone on for thousands of years with very little if any change? Most of these have taken no notice of what applied science can do for them and notwithstanding their age and great experience, compare quite unfavorably with industries which seem to have developed almost over night. Much work is done within limits established by experience without knowing why such boundaries exist until science provides the answer and discovers improvement in method. Compare progress in some of the ceramic industries, where rule-of-thumb methods, trade secrets and individual artistry have contributed to extremely slow development, with the growth of the synthetic dye industry. The difference is very largely due to highly organized scientific research and the intelligent application of its results.

On the other hand we find research at work in unfamiliar places. For instance some thirty corporations support the work of the Peronnel Research Bureau of the Carnegie Institute, Pittsburgh, where the best methods for selecting and developing executives, salesmen and clerks are sought. At the same place seven large department stores invest $32,000 annually in studies upon the best methods for selecting and training workers for about 900 positions in these establishments. These expenditures are ample evidence of the confidence progressive executives have in the rational use of scientific methods.

Cooperative Petroleum Research

IN *Mining and Metallurgy* announcement is made of the plan which has been developed to initiate cooperative research in the petroleum industry. A Division of Research and Statistics is to be organized by the American Petroleum Institute and $500,000 is to be supplied annually by contributions from the industry based on a very small percentage of the gross business. There are a great many problems which confront the petroleum industry and which are of moment to the public. The time has passed when the marketing of petroleum products is much of a problem, but designers of internal combustion engines must take into consideration available fuels and those which the future may supply. In other words we can no longer expect a fuel to be prepared to suit the engine without the engine being made to suit the fuel. In view of the demands being made upon our supplies of crude oil we must learn how to increase their yield of the most useful fractions. New uses for those petroleum products liable to be produced in excess of demands for ordinary uses are to be studied, as well as a number of drilling, pipe line, storage and tank-car problems.

Besides scientific research there is much to be done in economics. Systematic studies of international policies, of leasing and of bonuses are to be made.

As planned the director and technical staff are to have the services of an advisory committee composed of representatives from the Bureau of Standards, Bureau of Mines, Geological Survey, American Institute of Mining and Metallurgical Engineers, Society of Automotive Engineers, National Automobile Chamber of Commerce, American Society for Testing Materials, the American Chemical Society and the National Research Council.

Manganese Economy

WE are beginning to get information as to practices in certain countries abroad which enabled them to conserve raw materials of military importance. It seems that the practice of pre-melting ferro-manganese in electric furnaces especially designed for the purpose enabled the saving of 25 per cent of manganese as against the usual practice of adding solid ferro-manganese to molten steel. It is now believed that when solid ferro-manganese is added it is only partially absorbed by the steel and at least 30 per cent of the manganese content is lost by oxidation. The portions of manganese which remain unabsorbed in the steel may result in hard spots and cause other disadvantages. When melted separately and added in liquid form the loss of manganese through oxidation is said to be no more than 5 per cent.

Pyrometry

THIS subject is of such obvious importance that it seems worth while to call attention to a volume which has been published by the *American Institute of Mining and Metallurgical Engineers* which is a republication of the papers presented at the Chicago meeting of the Institute last September when a symposium on pyrometry was held in coöperation with the National Research Council and the National Bureau of Standards. This collection of papers is believed to be the best ever obtained on the subject and the list of topics and authors is ample to guarantee the interest of anyone working at high temperatures. The subject matter is divided under three headings: 1st, Methods of Pyrometry; 2nd, Industrial Pyrometry; and 3rd, Pyrometry and Its Relation to Science.

A Resistant Steel

THE daily press announces that the Krupp works has patented a new chrome-nickel steel alloy which will withstand acids as well as the corrosive action of water. Consequently it is hoped that a large demand will develop in connection with surgical and chemical instruments.

The note does not give the analysis of the new alloy, nor its physical and chemical constants, but it is difficult to imagine a better alloy for surgical instruments in so far as non-corrosiveness is concerned than our own cobalt-chromium-tungsten alloys which have become so important for machine and other tools. Where structural material is wanted our alloy from native ores has proven very satisfactory. This is a nickel-copper-iron combination which has withstood the test of several years.

It would seem therefore that we are ready to meet foreign competition in this special field.

Horses to Eat

AT the recent meeting of the Association of Official Agricultural Chemists, Dr. P. F. Trowbridge, retiring president, presented one method for the utilization of the approximately two million American horses unsuited to other work as sources of increased food supply. Products prepared by him from a horse 12 years of age compared most favorably with beef products of the same type, and in many instances were more tender and of better flavor. It would be interesting for some statistician to tell us how much our prejudice and fancies in food cost us annually.

Chemical and Physical Constants

OUT of the stock-taking following the war has come the realization that certain scientific knowledge and the means of access to it have been largely in the hands of the Germans, and that other countries have been obliged to rely on German publications in order to make any use of it at all. A notable instance of this is afforded by the situation as regards the chemical and physical constants so indispensable for precise work in all chemistry and physics and in the application of these sciences to industry.

The National Research Council, therefore, with the coöperation of the American Chemical Society and the American Physical Society has planned to compile and issue a critical American compendium of chemical and physical constants which shall be up to date and correct, which, by the way, the German publications were not. And yet these badly organized and inaccurate German compendia were the only ones available to the American experts during the war in connection with their all-important scientific work on the pressing problems of war technique.

This will be a tremendous task and will involve the expenditure of at least $100,000 which must be obtained from private sources. The committee representing the National Research Council and the American Chemical and Physical Societies will have to scour all the university and research laboratories of the country for the needed facts. In addition the committee will attempt to find out from the business and industrial concerns of the country whose work is based on applied chemistry and physics a list of all the constants required in their work, and then will undertake to have these determined by scientific investigators and included in the compendium. A successful outcome of this large undertaking will be of inestimable value to the scientific and material strength of the nation.

The European Sugar Crop

AS further evidence that the world supply of foodstuffs has fallen greatly below the demand, it may be cited that whereas before the war France produced about one million tons of sugar annually in 250 beet sugar factories, she is now expected to produce less than 150,000 tons in the 100 factories which remain after the invasion of her territory. In normal times France exported about 250,000 tons of sugar. Simple arithmetic shows that she is now not only unable to export any sugar, but on the basis of normal requirements needs to import 600,000 tons per annum. In Germany the area under sugar-beet cultivation has declined nearly 20 per cent. Fifty less than the normal number of raw sugar factories were in operation last season as compared with 1913, and both the weight and sugar content of the beets raised were seriously below the average.

More than one-half the sugar produced in the world before the war was from the sugar beet, and with the changes noted in the great beet growing areas, the seriousness of the sugar situation for some time to come is but too apparent.

Food Colors

TIME was when any colored food aroused great suspicion, but one of our leading American dye manufacturers is now making an extensive variety of certified food colors which comply with the Pure Food and Drugs Act and are certified in strict accordance with Government requirements. The purity and uniformity of the products are assured, and the reds, greens, blues, browns, yellows, orange and violet, seem to offer all that could be desired by confectioners, bakers, bottlers, extract manufacturers, and other preparators of food. By controlling the process from beginning to end, the chemist makes it possible to have fancies in color satisfied with safety.

A Glycerine Substitute

ACCORDING to a German patent soluble magnesia salts of butyric acid can be considered satisfactory substitutes for glycerine especially when in combination with a small amount of alcohol or glycerine. The butyrate is very viscous, neutral and has a low freezing point. It is non-corrosive, forms a clear solution in water, and mixes satisfactorily with glycerine and its substitutes.

Big Business Interests
Select SELDEN Trucks

The demand for speedy, dependable haulage service increases daily. The dispatching departments of many big business houses work on schedules as exacting as a railroad schedule. No part of the service is permitted to fail—each unit must meet a schedule.

For instance, nine Selden Trucks form the backbone of the great fleet of trucks operated by Sears, Roebuck & Co. Nine sturdy, dependable SELDEN Trucks carry daily 22,000 sacks of mail and 10,000 outgoing parcel post packages, in addition to hauling between the main Sears, Roebuck building and railway terminals, freight houses, docks and five enormous warehouses. 195 loads a day are carried by these Sears, Roebuck SELDEN Trucks, maintaining continuous schedule service.

In the recent six weeks Christmas rush period—a period when Sears, Roebuck & Co. shipped more than 180,000 packages a day—there was not a single call for repairs from a SELDEN Truck in service. Nor was there a single delay in dispatching recorded against a SELDEN Truck.

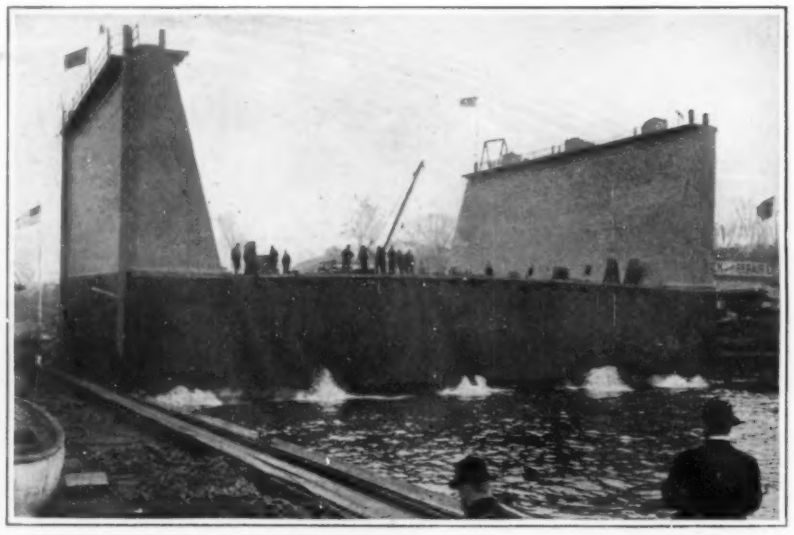
A similar story ot highly efficient performances of Selden Trucks can be told by the Transportation Managers of practically all of the largest operators of motor trucks in this country.

"Truck Transportation" will be mailed free to all interested upon receipt of request to Dept. S SELDEN TRUCK CORPORATION Rochester, N.Y.

1½, 2½, 3½, 5 Ton Models—All Worm Drive *Ship by Truck—SELDEN Truck*

Selden Motor Trucks

SELDEN TRUCK CORPORATION, Rochester, N. Y., U. S. A.



The "Minnesota" in dock in the sectional dry-dock, and an end view of one of the sections

A Wooden Dry Dock in Six Sections

AMERICA is peculiarly the home of the timber dry dock of both the excavated and floating type. We have several excavated docks which are 750 feet or over in length, not to mention many others of smaller dimensions; and the sectional wooden floating dock has been built for many years in all sizes, and of late years of the very largest capacity. The present article is concerned with what is claimed to be the largest wooden sectional floating dock in existence. It was recently completed by the Morse Dry Dock and Repair Company of Brooklyn, and it proved its lifting capacity by raising the 630-foot freight steamer "Minnesota," clear of the water in twenty-five minutes' pumping time. The "Minnesota" is one of the world's largest cargo carriers, and in wartime service she always carried over 22,000 tons of cargo, when she was not carrying troops or horses or other equipment. On one trip she found room on her decks alone for 168 complete motor trucks.

The sectional dry dock, as the name implies, is built in sections, each of which is entirely self-contained, having its own pumping plant and other necessary gear. Consequently, for docking ships, it is extremely flexible, as many of the sections being used as are necessary to accommodate the ship. Three sections, for instance, of this dock can raise a vessel of 15,000 tons net and 475 feet in length. The fourth and fifth sections increase the capacity in proportion, and with the sixth and last section now in use, the whole dock can accommodate vessels of 725 feet and of 30,000 tons.

For the construction of the dock, a site at the foot of 63rd Street, Brooklyn, was acquired and graded. The building ways on which the pontoons were constructed were formed by driving piles. These were capped by stringers, which were covered with four-inch yellow pine planking, and heavy launching-ways were built. On each side of these an elevated railway structure was erected, and two heavy electric traveling cranes installed, each with a boom of sufficient length to handle timber from the center of the property to the center of the pontoon which was being built. This elevated rail structure was extended out into the bay to facilitate the unloading of vessels and lumber rafts.

The new dock as regards its method of operation is a duplicate of the older dry dock of the company, which has the distinction of being the first electrically-equipped dock in the world and the first to be emptied by centrifugal pumps. Each section consists of a bottom or hull and two hollow side sections, forming a huge water-tight hull, built integrally and forming one massive and exceedingly stiff and strong construction. In operation, say as in the case of the lifting of the "Minnesota," the sections are alined end to end, and then valves are opened admitting water to the interior, until all of the pontoons have settled sufficiently to allow the ship to be towed into position between the side walls and properly centered. The pumps are then set to work and as the pontoons are emptied, they rise until the center line of keel blocks and the lines of bilge blocks take a snug bearing against the bottom of the ship. The pumping is then continued until the floor of the dock is well clear of the surface of the water.

It is evident that, in addition to the flexibility of this type of dock, there is the advantage that for raising vessels of medium and smaller size, there is less pumping to be done than in the case of an excavated dock of which the vessel fills only a portion of the length. Furthermore, the floor of the floating dock being entirely above water level, the work is carried out upon a dry platform and there is a saving in the amount of labor necessary to lift and remove material.

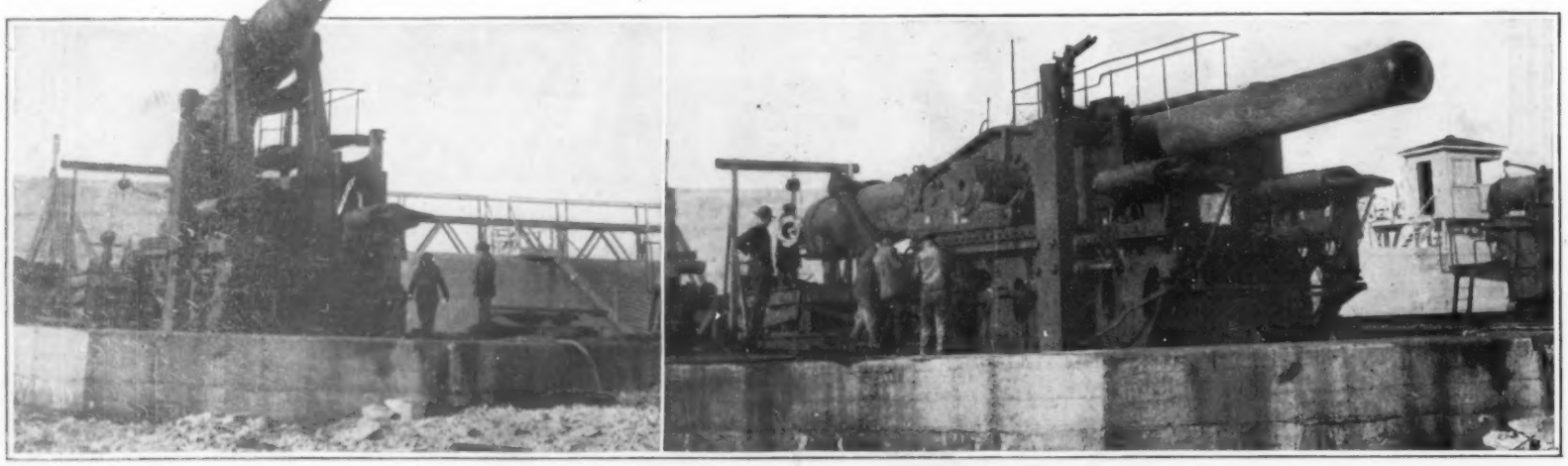
As showing the advance which has been made in docking facilities in New York, it may be mentioned that when the American liner "New York" was recently lifted after eighteen minutes' pumping, shipping men recalled the time in 1894, when this ship was sent from the port of New York to Newport News, Virginia, as the only place on the Atlantic Seaboard in which she could be docked.

Latest Model of Coast Defense Disappearing Gun

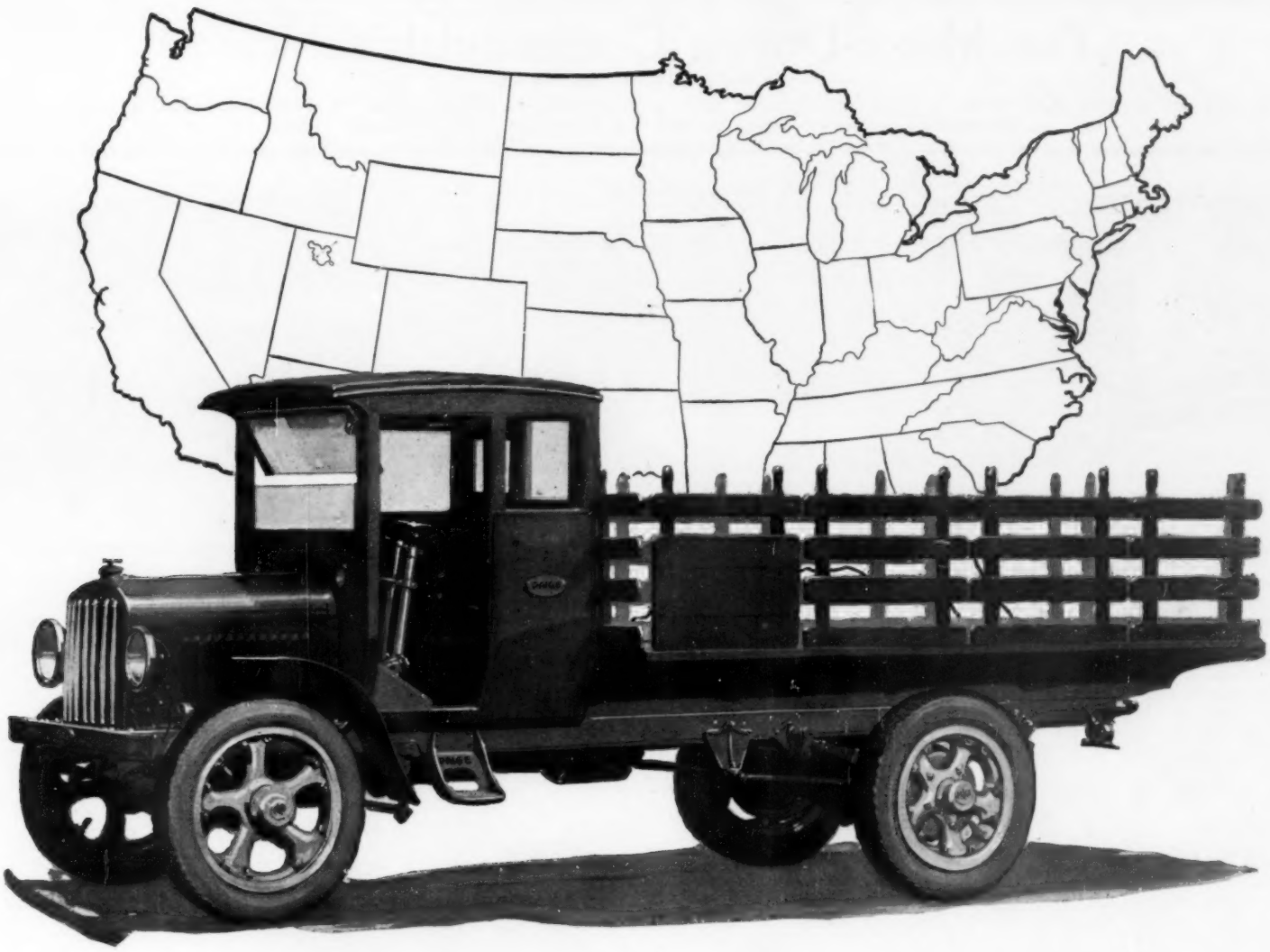
THE main defensive element of the coast defenses of the United States Seaboard is the disappearing gun, the latest model of which is shown in our two illustrations. The great merit of the gun lies in the fact that it can be loaded, trained and elevated while it is in the depressed position, and protected by the massive concrete parapet in front from the direct firing of the enemy guns. The principal criticism urged against the type is that it has no overhead cover or shield, and therefore is exposed to high angle fire or to shells fired at long range from ships at sea and therefore dropping with a steep angle of fall. It was designed when ranges were short compared with modern ranges, and when attacking fire was of the direct, high velocity kind. As against these objections, it is urged that it is possible so effectually to mask a disappearing battery that its location will be impossible to detect by an attacking fleet. That argument held good ten to twenty years ago, but of course, the development of airplane scouting has entirely changed these conditions, and it should not be difficult for the airplanes of the enemy to search out concealed batteries and direct the fire upon them. The alternative system of mounting guns permanently above the parapet and enclosing them in turrets with heavy roof protection, as is done aboard ship, has many strong advocates, and we look for a gradual substitution of this type of mount in the future.

In the Buffington-Crozier disappearing carriage, the gun is supported on its trunnions at the upper ends of a pair of massive cast-steel levers. At their lower end there is carried in journals a massive counterweight, which slightly overbalances the gun and, normally, is sufficient to hold the levers and the gun in the raised position, as shown in one of the illustrations. The levers have trunnions near their center which are journalled to a ring near the breech of the gun, and buffers are capable of a sliding horizontal movement on the upper face of the chassis or main supporting element of the gun. An additional pair of levers is journalled to a ring near the breech of the gun, and

(*Continued on page 318*)



The latest American disappearing gun, of 14 inches, in firing and loading positions



Backed by Nation-Wide Service

We can safely predict that our new one-and-one-half-ton Paige will win for itself the same measure of approval that has been enjoyed by all other products in the great Paige line.

For this latest model will have behind it the same factors that have made for the success of its companions in the Paige truck family—thorough mechanical excellence, supplemented by a nation-wide service organization the sole purpose of which is to maintain that original excellence day in and day out.

As the owner of this new Paige, therefore, you will have not only the satisfaction of possessing a truck that is strongly and excellently built but also the comforting assurance that, wherever you may drive, you will always be within a zone of Paige service, should mishap occur.

The reputation of Paige as an institution of ten years' standing is inseparably connected with every truck bearing the Paige nameplate. With so much at stake, we naturally see to it that every Paige truck makes good even beyond the expectations of the purchaser.

PAIGE-DETROIT MOTOR CAR COMPANY, DETROIT, *Michigan*

Manufacturers of Paige Motor Cars and Motor Trucks

PAIGE

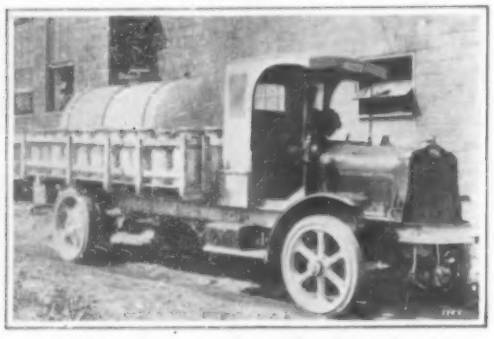
The Most Serviceable Truck in America

MOTOR TRUCKS

The Motor-Driven Commercial Vehicle

Conducted b MAJOR VICTOR W. PAGÉ, M. S. A. E.

This department is devoted to the interests of present and prospective owners of motor trucks and delivery wagons. The editor will endeavor to answer any question relating to mechanical features, operation and management of commercial motor vehicles



Tank truck for carrying milk, with racks at sides for cans

Special Truck for Dairy Use

THE accompanying illustration shows a truck developed especially for handling dairy products and is in use by a large Ohio Creamery. A large metal tank is provided for carrying the milk, which is white-enameled inside and can be kept sweet and clean at all times. The rack side platform provides ample accommodations for carrying a large number of the standard milk cans. With an outfit of this kind, the products of dairy farms over a wide area can be collected much more economically and delivered to the creameries in better condition than is possible by the present methods of railroad transportation.

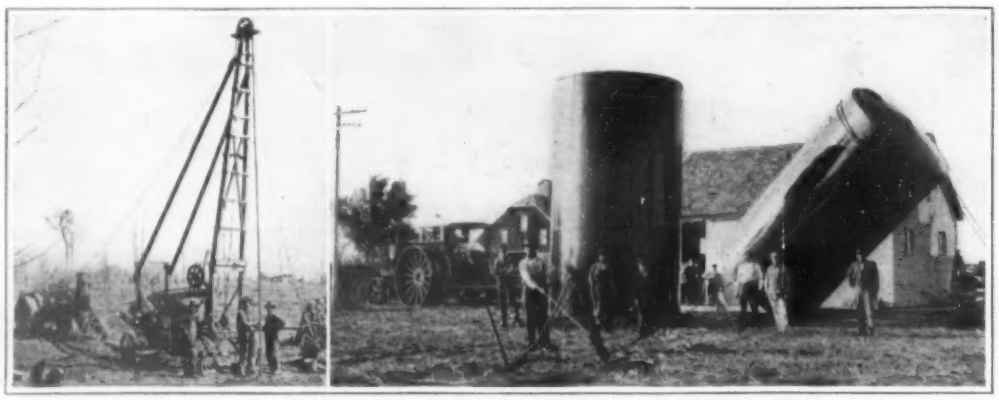
Diversified Uses for Tractors

THE agricultural tractor is by no means limited in its field of activity and that it can be used in a wide variety of power applications is brought out by advices regarding unusual applications received from time to time. The extremely heavy fall of snow this winter in all parts of the country has necessitated more than usual attention to equipment for snow removal. Horse plows have been generally used by farmers for road breaking. Some trucks have been equipped for this work in main highways in eastern states, and in rare instances tractors have been used either to draw or to push plows, but a new use for a farm implement recently developed, has been made.

The snow fall this winter in northern Illinois has been unusually heavy and to clear the walks and drives about its plant at Rockford, this company adopted a power cultivator with a conventional type plow. The plow is substantially built, having two 12-inch plank blades at either side, and is about 15 feet long. The blades are well braced at the front and rear with cross stays and the nose is protected by a steel shield which can be raised or lowered to any desired height by a simple lever. The source of power is a stock cultivator, which pushes the plow, and it is claimed to be equal to practically any work that may be required of it.

During the recent coal strike the shortage of fuel was such that states and municipalities made organized endeavor to meet the demands of the people for their household needs so far as this was practically possible. Some of the means to obtain power were especially ingenious, but these were largely dependent upon the use of power originated by internal explosion engines. At Des Moines, Ia., the Fuel Administration Board was forced to supply firewood for the use of citizens who were short of coal and it obtained a small tractor as a power plant, and operated this to drive a saw mill. For this work the tractor engine afforded smooth, even power at comparatively small expense.

The accompanying illustrations show the use of a 12-25-horse-power tractor in well drilling and how a 40-80-horse-power machine was used in raising a 7-ton oil tank in Kansas with a direct pull. When not used for agricultural purposes, the modern tractor can be applied to a large variety of industrial uses.

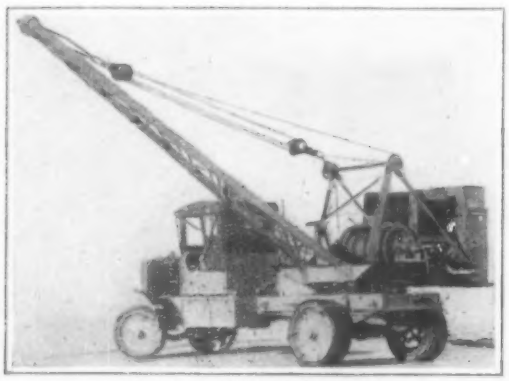


Left: **The tractor aids in well-drilling.** ***Right:*** **Raising a seven-ton oil-tank by direct pull.**

Unusual uses for the tractor in the oil fields

Mobile Hoisting Crane

THE advantages of the motor truck as a means of transportation are being recognized more and more in all fields of endeavor and it is especially appreciated by contractors because it will not only transport materials to the job and help in such important work as excavating, but can also be used for moving around the various appliances that general contractors use in their work. The truck shown in the accompanying illustration, is equipped with a special lifting crane that has a large radius of action. The crane boom is built up of structural iron shapes thoroughly braced with steel cross-bars and is exceptionally strong for its weight. The hoisting winch is operated independently of the truck engine by a special power plant carried back of it. The crane platform is mounted on a large gear and can be turned by the engine power to any point of the compass, carrying with it the crane-operating power plant and counter-poise. This counter-poise, which is fitted to balance loads lifted by the crane, is made of cement blocks held in place by an angle-iron frame-work. The crane platform is provided with a set of control levers for manipulating the winch and boom, these being conveniently placed in front of the seat while those that regulate the auxiliary power plant are carried on one side of the bracing frame-work of the crane. The arrangement is such that practically all of the crane weight is carried by the rear axle and special jacks are provided to relieve the truck springs and axle of any strain when lifting heavy loads, these being placed between the frame and the ground. The outfit shown can be used for a large variety of construction work.



A motor-truck traveling crane

Farmers Use Most Trucks

THE most numerous class among motor truck users of the world is the American farmer, with 79,789 motor trucks in operation. Manufacturers come second with 75,928, and retailers third with 74,486. These figures are taken from reliable statistics for the year 1917. Estimates for 1919 show a tremendous increase in the number of motor trucks in use; but with the farmer still in the lead. It is estimated that during 1918 approximately 350,000,000 tons of farm products were hauled to market in motor trucks by the farmers and gardeners of the United States. The actual operating figures averaged for the United States show that motor truck transportation is about half as expensive as horse drawn transportation. The motor truck handles life's necessities more economically than animal drawn vehicles can.

Dump-body truck for hauling wheat

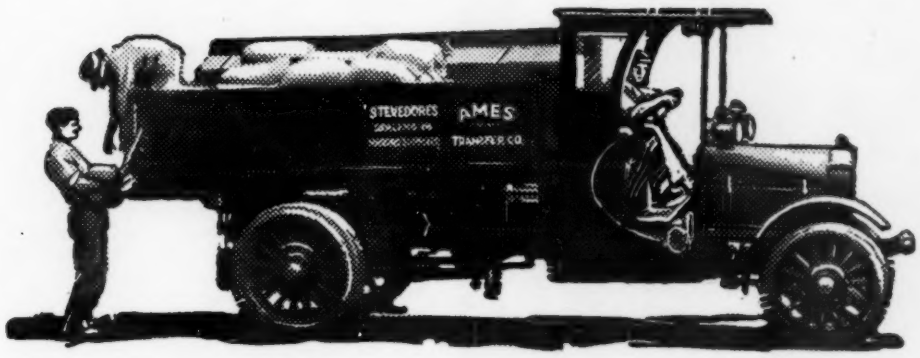
The accompanying illustration shows a special truck of dump-body type used in hauling wheat and shows one of the numerous uses to which the motor truck is adapted. It carries seventy-five bushels of wheat to the load; ten miles to the elevator, five minutes to unload, back for another load—and two more. Four loads per day—300 bushels hauled—1,800 bushels in a week. That is what the farmer can do with an automatic dump grain-tank-equipped motor truck such as shown in the illustration. Two-thirds of the time that he spent on the road hauling with horses before, he can now spend in his fields.

New Disk Wheel for Trucks

THE rapid increase in the use of pneumatic tires for motor trucks has brought with it some tremendous changes in the motor transportation field. Because these giant motor truck tires require an entirely different wheel for their use, a large manu-

(Continued on page 318)

Special disk wheel for pneumatic tires



48 of the First Fifty

Pierce-Arrow trucks are still running after 8 years. Many of these owners have standardized with Pierce-Arrows and will use no other truck.

We believe a truck must be inspected regularly. It keeps the truck running most of the time, reduces repair bills. Our inspectors save owners thousands of dollars by their suggestions.

No. 25 has served the Ames Transfer Co., New York, for 8 years. Tried out in competition with mule teams formerly used, its record was so good these teams were all displaced by Pierce-Arrows.

They standardize now with 36 Pierce-Arrows, each bought with profits earned by the trucks.

The actual mileage covered by No. 25 is in excess of 150,000 miles. The original worm still serves with no evident diminution of power.

Pierce Arrow

Delivers more work in a given time.

Loses less time on the job and off the job.

Costs less to operate and less to maintain.

Lasts longer, depreciates less and commands a higher re sale price at all times.

THE PIERCE-ARROW MOTOR CAR COMPANY, BUFFALO, N. Y.

Spicer

UNIVERSAL JOINTS AND PROPELLER SHAFTS

AT the SPICER plant special presses shape the steel housings which keep the lubricant in and the dust out of SPICER UNIVERSAL JOINTS.

So accurately are these housings formed that they remain permanently dust-proof and grease-tight. This is one reason why, since 1904, SPICER UNIVERSAL JOINTS and PROPELLER SHAFTS have outlasted the finest cars.

Today over one hundred of the leading makes of automobiles and trucks are SPICER equipped.

Genuine SPICER UNIVERSAL JOINTS bear the SPICER name on the flange.

SPICER MFG. CORPORATION
SOUTH PLAINFIELD, N. J.

The Stamping: Number Twenty of a series of SPICER advertisements.

© S. M. C. 1920

Spicer Propeller Shaft

America's Share in World Production

(*Continued from page 295*)

sarily a paramount one. Forty per cent of the world's lead and iron leaves us even in a minority against the combined production of other lands—but still in a dominating position against any one of them. Seventy-five per cent of the world's corn—that is to say, corn in the American sense, the sense which our English cousins render by using the word "maize"—this we can produce without embarrassing anybody, since we ourselves consume practically all of it, exporting but little. But our sixty per cent of the world's cotton, constituting a clear majority against the combined efforts of Egypt and India; and our two-thirds of all the oil, at a time when Mexico and Rassia, our chief competitors, are largely out of production, while Roumania has not yet recovered her stride—these are the items that make American materials bulk large in the program of all the European nations. Another item of importance, and of an importance that ever increases, is the aluminum of which we supply three-fifths of all that is refined.

That we are a manufacturing people as well as producers of raw materials is amply indicated by the figure for wire. With but forty per cent of the world's iron we supply sixty per cent of the wire. Of course a goodly part of the difference between these figures may be attributed to the copper wire of which we must have a very large monopoly; nevertheless, it is clear that our position in world production is such that foreign customers cannot wholly escape the necessity of buying a good portion of our labor as well as our materials. The paint situation throws further light upon this feature; in this essentially chemical industry we are able to stand on a par with all the rest of the world, in spite of the position always held by Germany in the chemical field.

Perhaps the biggest disappointment in all the figures that are shown in the chart herewith is that of wheat. We like to think of ourselves as one of the granaries of the world. Well, so we are; but Canada, Argentina, Australia, Russia, with the aid of small producers here and there, are able to triple our production.

What Shall We Say to Mars?

(*Continued from page 298*)

a few more pictures you will guess that it represents the earth's dominating inhabitant, even if you yourself are built on quite different lines. Next you will receive shapes (hand, head, etc.), which you will guess are parts of this being. The next message should suggest that this is apparently the same man in a variety of attitudes; and as your gallery of pictures increases you will gain a further idea of his activities and pursuits. We will, however, leave you to your own deductions and follow the explanation from the standpoint of the earth.

On Figure 8, directly beneath the picture, is a group of dots and dashes. They spell, in Morse code, the word "man." Similarly, the next messages would be labelled "hand" and "head." To indicate that these code marks are intended as labels, the various pictures are always associated with the same code letters. Followed consistently, this practice will compel the Martians to the conclusion that these marks are arbitrary symbols for the various objects pictured. In other words we are building up the interplanetary language, with which in time to replace the pictures. In actual application, the chances are we shall not use English words, but some language of more logical construction, like Esperanto. We will now go on to show how man lives; and always the lessons in language go hand in hand with the pictures. We could show, for instance, a pick, shovel, bar and wheelbarrow; and then we could illustrate their use in the basic industry of digging. We could show a man and part of a house; an article of clothing—to be specific, a pair of trousers—with subsequent pictures indicating the man putting them on; another picture will give the same views with a coat, and these two will convey the idea that we habitually wear garments. By such pictures as these we should be able to convey the significance of verbs, as well as nouns. To describe our family relations we shall probably show a series of pictures of a man, woman, boy and girl. Of course, these meagre views will have to be greatly elaborated before we can be sure the Martians have an adequate conception of their meaning. Then we may take up the subject of agriculture with a picture of an apple-tree and apples, and a man about to pick an apple. In the next view the man who was on the point of picking the apple has done so, and then we show him acting out the caption "man eating apple."

Having established our personality, we can let that subject wait while we concentrate on building up our interplanetary language. Objects for early attention would be geometrical shapes, properly labelled. With the aid of these we can introduce a few primary adjectives, "small" and "large" being illustrated by appropriately proportioned squares and circles; our numerical system can be explained very easily by mere counting in dots. Then we could introduce the preposition, the attempt being based on such mutually explanatory expressions as "circle in square" and "square in circle," and similarly with other prepositions which can be shown in a graphic manner.

In working up to actual sentences we must begin by putting together words we have already used, such as "one man sitting on wheelbarrow," "one man and one woman standing on cube," etc., with illustrations. Soon we shall be transmitting whole pages of Morse which the Martians can puzzle over, and by the help of words they do know, gain a knowledge of the rest, many words, of course being very difficult to show by pictures, and best acquired through their context with known words. At this stage our language will develop very rapidly.

The system of signalling is really quite flexible, for in the end we shall be able to transmit pictures as clear as the half tones in a newspaper, which, as a good many readers have probably noticed, resemble these dot and dash pictures very closely. Except for the time it would consume we could send whole reels of movies; or, after giving detailed directions for making a phonograph, and flashing a picture of the wavy lines of the record, enable the Martians to hear our actual voices. It must be remembered that fair speed could be attained in sending messages; if we equalled the rapidity of an ordinary heliograph probably an hour or two would suffice for one complete picture; in the course of a few months an entire book of them could be transmitted, and within a few years a simple language learned. Of course, in our entire lack of knowledge of the Martian mind we cannot tell how they will react to our attempts to enlighten them, but if the planet is really inhabited by intelligent beings, and they apply anything like the patience and ingenuity that we would give to studying the signals received from them, it cannot be doubted that in time we shall come to a complete mutual understanding.

Strange Things to Eat

(*Continued from page 302*)

sago and casava. The crystalized violet and rose leaves of the French are regularly imported from the Nice region, retailing in Manhattan at $1.50 a pound. As a comfit they thus retain their bouquet well.

Little-known queer seed oils used by

(*Continued on page 314*)

Why the Notches?

The notches or side vents in a Kelly Caterpillar tire are not put there for ornament.

They serve a very definite purpose —several, in fact.

They give greater traction. They enable the tire to grip the road surface. A Kelly Caterpillar can roll serenely over a road on which the ordinary tire would be helpless without chains.

They greatly increase the tire's resiliency. In a Caterpillar the rubber displaced under load pressure has somewhere to go—and it can go there quickly.

The traction wave is practically done away with. It is broken every few inches so that it has little opportunity to damage the tire or hold back the truck.

There are merely the advantages which the side vents add to a tire that even without them would be in a class by itself.

KELLY-SPRINGFIELD TIRE CO.
New York, N. Y.

Protected by U. S. Patents
June 28, 1904
Aug. 31, 1915
Mar. 14, 1916
Feb. 19, 1918

KELLY SPRINGFIELD TRUCK TIRES

DURACORD
TRADE-MARK

PORTABLE ELECTRIC CORD

gets run over, dragged over sharp edges, walked on and abused in other ways. Workmen, however conscientious, cannot watch the entire length of cord on their portable electric tools or extension lamps.

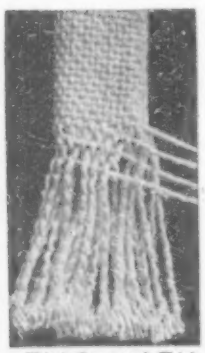
Duracord is made to stand up under just such usage. Its thick *woven* covering defies wear that would ruin ordinary cords.

In plant after plant where only the highest grade of equipment is purchased, Duracord is used on all kinds of portable electric tools and extension lamps that require a cord which must withstand rough, hard service.

Ask your electrical jobber about Duracord or let us send samples of Duracord and ordinary cord for you to test and compare yourself.

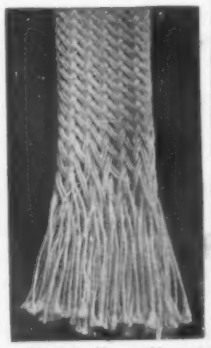
TUBULAR WOVEN FABRIC CO.
Pawtucket, R. I.

Makers of Duraduct
Flexible Non-Metallic Conduit
and tubular woven fabrics of all kinds.



This is Duracord. Thick, heavy strands, woven like a piece of fire hose, not braided. Picture shows outside covering only with impregnating compound removed.

These pictures tell the story



Here is the ordinary braided cable covering. Note the open and porous construction, easily cut, stretched or unraveled. Compare it with the illustration of Duracord.

Strange Things to Eat

(*Continued from page 312*)

lavantine peoples in Manhattan are the sesame and the white-popy-seed oils. The latter has fair drying properties, so is sometimes used by artists in lieu of nut oils. This oil from the white poppy seed, properly bleached, is the only water-white vegetable drying oil which I have ever met. All other oils, I believe, are at their best a straw-colored white.

Most of us have heard of the chestnut bread of the Italians. The flour is readily purchasable in Manhattan. For forming into cookies, pastries, little cakes, etc., no sugar is required; the seven per cent sugar content of the chestnut is sufficient sweetening. In these days of sugar famine, even though of temporary duration and caused partly by transportation troubles, this is worth bearing in mind.

There are some two hundred edible sea-weeds or marine food plants of one sort or another. The dulse of the groceries of Manhattan's little "Irish Republic" is a familiar example. The orientals use the largest variety, which is nutritious and slightly aperitive. The agar-agar forms the base of the tremulous gelatine dishes of the orient. The Irish dulse gives to soups a delectable clam-broth flavor which they do not possess.

"Give us this day our daily bread" is an invocation common among all nations, whatever their religion. And what curious bread forms are to be found! Many of them you would not believe were breads at all, unless informed—as the bread sheeting of Asia Minor, which looks like so much chamois leather; the hard-tack in chain form of the Balkans and south Russia; the blood bread of the Scandinavian countries; the tissue-like gluten sheets of the Bosporus; the braised-in-oil bean bread of the Japanese; the tree-pith biscuit of the Mongols—and so on until a score of queer breads might be cited.

The ripened eggs of the orient are as edible and nutritious as our ripened cheeses—though just how edible that is must be left to individual judgment. They are matured black to the yolk, and all the odors of decomposition have passed away, save maybe a feeble earthy odor with an ammoniac suggestion. They are used as sold, or can be served up in soup dishes. The flavor is somewhat reminiscent of oysters.

The land of Cathay appears to be the only region of the globe given to maturing eggs by earth-preservation. This is as logical as our ripening of game meats like deer and bear and wild fowl.

The world is said ever to have had three ages of doubt and mystery: the stone age, a woman's age, and saus-age! Here in Manhattan you can get among the Italians a chocolate-paste in sausage form; also print (or unsalted) butter and lard in sausage skins. The Scotch put up an oat breadstuff in Bologna skins; and a Pacific concern is now marketing a sausage ware made wholly of fish meal. Of course, apart from foods one can purchase in little old New York such sporty articles as putty and soap put up in membrane links.

Some other queer foods noted during the preparation of this article were the peculiar smoked pears of the Germans, wrinkled to unrecognizability; the pressed fig-coffee of what is now the Republic of Austria (usable either as food or as beverage); the canned snails of Spain and Portugal; the jumbo walnuts of Chile and Manchuria, measuring nigh half a foot in girth; the gingerbread in sausage form of the south Russians; chestnuts the size of goose-eggs from Liguria; sun-dried devil-fish from Greece; white chocolate from Switzerland; buckwheat macaroni from Japan; bean cheese from Mongolia, made solely from the ripened bean-curd; figs from Izmir with four-inch spread, of honeyed choiceness; Corean macaroni made from the soy bean; hollow bamboo-shaped bread from Japan again; crystalized cherry blossoms from the same land—and a vast number of other oddities.

In foods Manhattan must be rated the most cosmopolitan city of the globe. In this article, as in prior ones on the same subject, this has been amply proved by instance and illustration. Perhaps it will not be out of order to state definitely, as has been stated on previous occasions, that everything illustrated or described has actually been purchased by the author "somewhere in Manhattan."

The Telephone as a Water-flow Gage

(*Continued from page 303*)

current. Out in Iowa the State Highway Commission, collaborating with the State and Federal Geological Surveys, is measuring and recording stream speeds for many small rivers. A current of 10 miles per hour is apt to be destructive to any poorly designed or ill-made bridge.

Not all water in a stream flows at the same speed. On the surface it is retarded by friction with the air; on the bottom friction with the bed and with obstructions, such as large boulders or fallen trees, slows the flow. The shape of the bed at any section affects velocity. A half circle presents the smallest area and the least friction, hence water should here flow faster. It might be supposed that average velocity would be at half the depth, but experience has shown it to be at 6/10 the depth.

The device shown in the accompanying photograph is a unique member of the meter family and measures stream velocity. The observer stands preferably upon a bridge and lowers the meter by the cable shown coiled. The lower figure in the picture, though it looks a bit "fishy," is essentially a lead weight of from ten to forty pounds and used to steady the meter. Above it is a shaft carrying a set of little cups like a water wheel. The "tail" or "fin" behind the instrument keeps it headed against the current. Each revolution of the wheel makes an electric contact, the sound of which is conveyed to the ear of the operator above by means of a little telephone receiver which, with its battery and cable, is shown in the upper right hand corner of the photograph. The operator uses a stop watch and times the number of contacts. From a table prepared in advance for each special instrument he is able to read the velocity in terms of feet per second.

For any gage height of the river the area of the cross section has been computed and recorded. To determine the amount of water passing a point it is then necessary to know the velocity. While the speed changes with varying height of the water it is approximately the same during each successive flood when the same height is repeated. Thus after a complete series of discharge measurements have been made for any observation point the run-off at any future flood can be quickly foretold when the gage observer at that moment telegraphs or telephones in to headquarters the stage of the stream's height.—By *Aris Gordon Vestal.*

New Orlean's Industrial Canal

(*Continued from page 304*)

two feet at the top. Six thousand tons of reinforcing steel will be needed and 125,000 barrels of cement. Two and a half million feet of lumber will be used in building the forms. The total cost of the concrete will be about $2,225,000.

The lock will have five sets of gates, built of steel plates and rolled shapes, four and a half feet thick and weighing 400 tons to the pair. Four sets of gates will be of 55-foot size, one set of 42-foot size. When open they will fit flush into the walls. Each gate will be operated by a 52-horse-power motor.

As an added precaution there will be an emergency dam, consisting of eight girders measuring 3 x 6 x 80 feet and weigh-

(*Continued on page 316*)

In many cities production can be increased, its quality improved, and new industries added by efficiently making and using the available power

G-E Equipped Hydro-electric Plant

How electricity increased and improved a textile city's production

EACH mill in a certain textile city was driven by its old water wheel —production was low, so was quality.

In summer, low water and leaky canal beds slowed up the wheels—in winter, anchor ice did the same.

Finally, G-E textile mill specialists were called in to suggest a better way of using the water power.

A central water power plant was built to supply all mills with electric power and provide a surplus for new industries.

Electric drives at each mill applied power directly to productive machines, and losses due to mechanical drives were largely eliminated.

Machinery was enabled to operate at a constant maximum productive speed.

Its output was increased 35% and a very much better product resulted.

Any community's efficiency may be increased manifold by the proper utilization of Nature's resources and the application of electricity in homes, industries or on farms.

Look for this mark of leadership in electrical development and manufacture

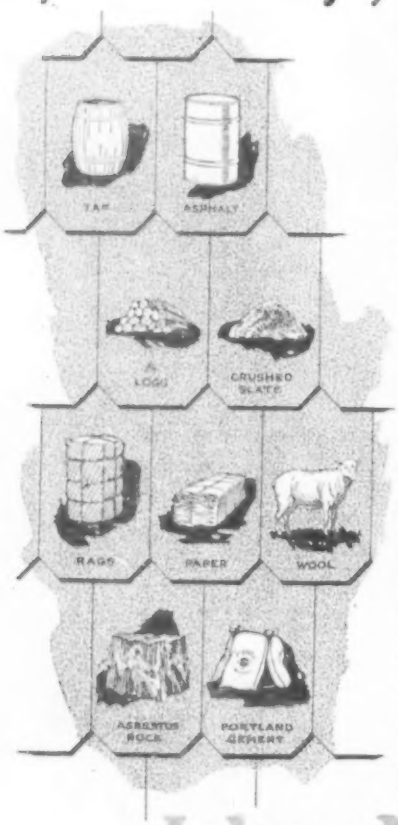
GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

G-E motors

From the Mightiest to the Tiniest

GENERAL ELECTRIC COMPANY

Which of these materials would you use—*if you made your own shingles?*



Two Broad Classes or Kinds

Broadly speaking, there are two classes into which shingles may be divided—the organic or vegetable type and the all-mineral type.

The shingles of the former variety are those made of paper, wood pulp, wool felt and other organic materials. These are usually saturated with tar, asphalt or other water-proofing materials and sometimes coated on the weather side with crushed slate. They are known to the trade as asphalt shingles. The wooden shingle also falls in this class—as being of organic origin.

Shingles of this kind are very common at present, and there are many brands from which to choose.

The factors which limit their life are the ordinary decay to which all organic materials are subject, and which cannot be permanently avoided—possible softening in hot weather or brittleness in cold weather. Some organic shingles are said to be fire-resisting—due to the coating of crushed rock or slag.

Aside from slate and tile, which are not ordinarily classed as shingles but called by their own names, there is but one all-mineral shingle—because there is so narrow a choice among mineral materials that will combine to make a shingle.

Johns-Manville Asbestos Shingles

The All-Mineral Type

So far as we know, the only materials that are entirely suitable for all-mineral shingles are Asbestos fibres and Portland cement — properly combined.

Johns-Manville Asbestos Shingles (made from this combination of minerals) cannot burn; they cannot rot or disintegrate—they are absolutely immune to the destructive forces that attack and destroy the necessarily perishable shingles made of organic materials.

So when you choose your shingles, you have a wide range of selection among the organic shingles, almost any of which will give you a water-tight roof as long as they last.

But there is only one indestructible all-mineral shingle—the shingle that is made of Asbestos. Johns-Manville Asbestos Shingles are as fire-proof and durable as the everlasting rock of which they are made.

Our shingle booklet contains full information about Johns-Manville Asbestos Shingles. Send for it.

H. W. JOHNS-MANVILLE CO.
New York City
10 Factories—Branches in 63 Large Cities
Canada: Canadian Johns-Manville Co., Ltd., Toronto

JOHNS-MANVILLE SERVICE
COVERS THE CONTINENT
Through—
Asbestos
and its allied products
INSULATION *that keeps the heat where it belongs*
CEMENTS *that make boiler walls leak proof*
ROOFINGS *that cut down fire risks*
PACKINGS *that save power waste*
LININGS *that make brakes safe*
FIRE PREVENTION PRODUCTS

JOHNS-MANVILLE
Serves in Conservation

New Orleans Industrial Canal

(Continued from page 314)

ing 90 tons each. There will be a 300-horse-power crane to drop them across the lock, in slots in the walls. It will take only one hour to do this.

Ships will be warped into and out of the lock by six capstans, operated by 52-horse-power motors and developing 35,000 pounds pull each.

The lock will be filled and emptied in 20 minutes, by two channels cast in the base of the monolith, and measuring 8 x 10 feet. Openings will be controlled by eight sluice gates, each one operated by a 52-horse-power motor.

Empty, the lock will weigh 225,000 tons; filled with water, 350,000 tons.

To the top of the lock walls, the ground will be sloped on a 150-foot series of terraces, which will be developed into a public park. These will brace the lock against the weight-pressure of the water. The lock walls will be held against the earth pressure when empty by heavy concrete anchor columns.

According to the closest estimates that can now be made, the lock will cost $7,321,524. Machinery and mechanical equipment represents $1,516,900 of this.

Another notable piece of work on the Industrial Canal is the siphon, the largest of its kind in the United States.

The Industrial Canal crosses the Florida Avenue drainage canal, through which the city's entire drainage will be sent, according to new plans developed during the war by the Sewerage and Water Board, into Bayou Bienvenu and thence into Lake Borgne—relieving the lake front of New Orleans of a pollution that has retarded development on that ideal suburban site.

The siphon is 378 feet long and carries the drainage canal underneath the ship canal to the pumping station on the other side, where it will be sent into Bayou Bienvenu. Built of reinforced concrete, the siphon is divided into two storm chambers measuring 10 x 13 feet each, one normal weather chamber measuring 4 x 10 feet, and a public utilities duct.

In normal weather the drainage will be sent through the smaller chamber, the concentration creating a strong flow and preventing the settlement of sediment. The storm chambers will be used as necessary. The siphon has a capacity of 2,000 cubic feet of water a second.

The public utilities duct will contain the gas and water mains, electric light cables, telephone and telegraph lines, etc.

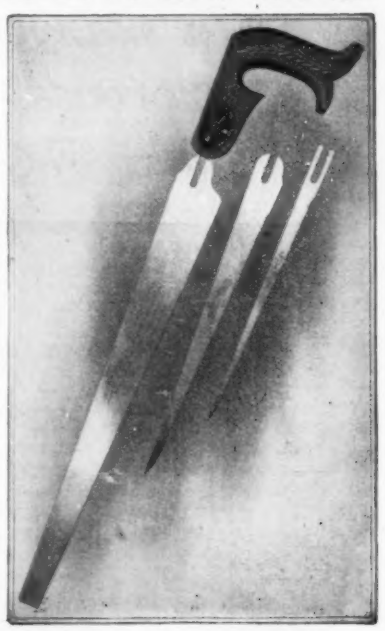
Eight sluice gates, operated by hydraulic cylinders, will control the water chambers. There are eight manholes, measuring 4 x 6, 6 x 6, and 6 x 13 feet, through which access will be had to all parts of the siphon, in case repairs are necessary.

The floor of the siphon is laid 46 feet below the surface of the ground, on piling 30-60 feet long, and from 3 to 5 feet apart on centers. Similar difficulties were encountered here as on the lock site, but the job being smaller, they were easier to overcome. It took a year and a half to build the siphon. The preparation cost $400,000—excavation, foundation, etc. The concrete cost $170,000. Machinery and incidentals cost $60,000.

There will be four bridges across the Industrial Canal. Three are railroad bridges with a span of 117 feet; they cost $500,000 each. They have been completed. The fourth will be the general traffic bridge at the lock, and will have two railroad tracks, two street car tracks, two automobile roads, and two ways for pedestrians. A 2,000-foot concrete viaduct will lead to this bridge. The viaduct has been finished, but the bridge has not been begun. The material for it, as well as most of the material for the lock equipment, is on the ground.

The Industrial Canal has already brought $35,000,000 of new, and so far as can be judged, permanent development to New Orleans. It's a big and costly job, but it is yielding big dividends.

SIMONDS

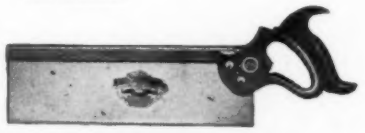


Edgeholding

—all of them: Compress blade, keyhole blade, and that all-purpose 18″ blade made for cutting either wood or metal.

A handy kit for contractors on roof, or floor, or any kind of repair work entailing nail and metal work cutting.

***Edgeholding*—the outstanding quality of Simonds Saws—because of the Simonds-made steel that's in them.**



Simonds Manufacturing Co.
Fitchburg, Mass.

"The Saw Makers," Established 1832

CHICAGO, ILL. — VANCOUVER, B. C.
NEW YORK CITY — LONDON, ENG.
PORTLAND, ORE. — MONTREAL, QUE.
LOCKPORT, N. Y. — MEMPHIS, TENN.
NEW ORLEANS, LA. — SEATTLE, WASH.
SAN FRANCISCO, CAL. — ST. JOHN, N. B.

SIMONDS SAW STEEL PRODUCTS MADE RIGHT SINCE 1832

We Will Make It
Anything in a metal stamping or novelty produced from any metal and finished in any color.
Waterbury Button Co., Waterbury, Conn.

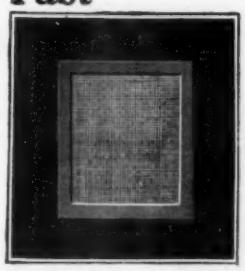
The "BARNES" Positive Feed
Upright Drills

10 to 50-inch Swing
Send for Drill Catalogue
W. F. & Jno. Barnes Co.
Established 1872
TRADE MARK
1999 Ruby Street — **Rockford, Illinois**

INCo MOnel metal

alloyed by nature to resist

rust



Window Screen is practically everlasting.

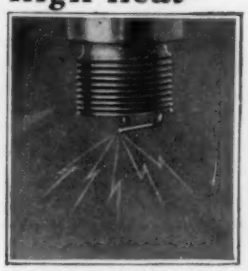
superheated steam

Valve Fittings do not erode.

acids

Superior for Chemical Apparatus.

high heat



Spark Plug Electrodes stand up longer.

salt air

Marine Fittings do not corrode.

MONEL is as strong as steel but will not rust.

It is more non-corrodible than copper and resists wear far better than bronze. It burnishes like silver but does not tarnish. The rapidly increasing use of MONEL for hundreds of purposes both industrial and domestic is due to the fact that this remarkable metal possesses a combination of great strength, durability and non-corrodibility that cannot be matched by any other available metal or alloy.

Because of these unique characteristics MONEL is fast displacing steel, bronze, and their alloys for special parts in many lines of machinery and power plant equipment such as valve trim, pump rods and liners, and turbine blading. MONEL is also contributing greatly to the development of the chemical industry and is now generally used wherever acids, strongly alkaline solutions, or highly corrosive gases are manufactured or handled.

The use of MONEL for domestic purposes is constantly growing for the same reasons that lead to its increasing employment in the industries. These uses include window screens, table cutlery, refrigerator lining, coffee urns, kitchen equipment, and ice cream freezers.

Some of the many other purposes for which MONEL has proved superior are marine fittings, roofing, spark plug electrodes, golf club heads, and surgical instruments.

MONEL is a natural alloy of 67% nickel, 28% copper and 5% other metals. It can be machined, cast, forged, rolled, drawn, brazed, soldered, and welded by electric or oxy-acetylene method. Wherever it is used wear is largely reduced and corrosion prevented.

Manufacturers are using MONEL in larger and larger quantities for a wider and wider variety of purposes because they have found that MONEL renders a service that effects great economy and efficiency over the material previously used.

Our experience as sole producers of MONEL Metal since its discovery in 1905, is at your disposal through our Sales or Technical Departments.

The International Nickel Company has served industry for more than half a century through the production of a wider variety and increasing number of better Nickel products. In purchasing INCO Monel Metal, INCO Nickel, and INCO Nickel Salts, you are assured of the highest and most uniform grades of Nickel that the world produces.

INCo MONEL METAL TRADE MARK

THE INTERNATIONAL NICKEL COMPANY

43 Exchange Place, New York, N. Y.

The International Nickel Company of Canada, Ltd., Toronto, Ont.

INCo NICKEL TRADE MARK

QUEEN'S RUN FIRE BRICK—

The Meaning of Hand Methods

NO machine has been invented that can make as good brick as can be made by hand. That's why most of the brick turned out at the Queen's Run plant are made by workmen who have learned their trade, many of them, from generation to generation.

But the most careful methods of manufacture will not bring satisfaction to the fire brick user unless the best judgment is shown in selecting the right brick for his purpose. Ask our engineering department if the life of your furnace linings couldn't be lengthened.

Since 1836 this company has been making fire brick to suit the varying conditions in hundreds of different furnaces. We make a specialty of unusual shapes.

Department S. A.

THE QUEEN'S RUN FIRE BRICK CO.

LOCK HAVEN, PENNA.

Organized 1836

Latest Model of Coast Defense Disappearing Gun

(*Continued from page 308*)

at the lower end of these are means for giving them a vertical movement for the purpose of raising or lowering the breech and so giving the gun the desired elevation.

When the gun is fired, the force of the recoil acting through the supporting levers forces the hydraulic buffers back, and at the same time causes the gun to move to the rear in an elliptical path and settle down into the rest position, the heavy counter-weight simultaneously being brought up vertically out of the pit in which it is suspended during fire. The gun recoils until it is entirely below the parapet. In this position it is reloaded and the corrections in elevation and in traverse are made in accordance with instructions received by telephone from a protected firing station well to the rear of the gun, where the battery commander has his position.

The gun shown in our illustrations is one of the latest Army 14-inch pieces, the trials of which have given, we understand, great satisfaction. The illustrations show the gun mounted at the Proving Grounds at Sandy Hook, where it was tested out.

New Disk Wheel for Trucks

(*Continued from page 310*)

facturer of disk steel motor truck wheels, has in coöperation with the important tire manufacturers, designed a disk steel wheel having unique advantages for the use of pneumatic motor truck tires. A slot cut from the outer edge of this wheel to the center of the rim, admits the valve stem of the inner tube. The wheel is designed so that two strong web braces come beneath the slot, one on each side, thus reinforcing the rim and making it even stronger at the slot opening.

When it is remembered that these tires weigh approximately 250 pounds apiece and that it takes a strong man to lift such a tire, this feature is appreciated. The ease of replacement—simply pushing the tire in place, makes tire changing on the disk steel wheel a one-man job. The advantages of the pneumatic tire for motor trucks, over the solid type, have led to the adoption of the pneumatic by truck builders and truck users in practically every line of business. Speed with perfect safety to the load, and less wear on every part of the truck, permitting a much wider range of travel over every sort of road or no road at all, appeal to business men who desire rapid freight transportation. The pneumatic tired truck is making such hauls more practical and profitable and has led to the establishing of many new intercity motor truck freight routes. In many cases it has been found cheaper, as well as more speedy, and pneumatic tired trucks have begun to carry the mails between towns and cities. The danger of skidding on slippery surfaces is overcome by the giant cord tires which are designed with a tread and structural strength that gives them a firm grip and renders them less susceptible to injury from stone and other bruises caused by rough roads.

The advantages of pneumatic motor truck tires mounted on disk steel wheels may be listed as follos: Reduction in mechanical repairs; increase in permissible speed; decrease in gasoline consumption; decrease in oil consumption; less fatigue for the operator; more efficiency; less breaking of load, especially when fragile goods are carried; greater tractive and climbing ability; more frequent hauls; less wear on roads.

The engineers of the disk steel wheel manufacturer spent several weeks at the various plants of these large tire manufacturers, where in conjunction with the tire companies they worked out in detail the requirements for a steel wheel suitable for trucks of all tonnages and every make of motor truck tire. As a result of their work these disk steel wheels are being offered by truck builders as standard equipment and may now be secured by all users and owners of motor trucks of whatever make or capacity.

Potash from a New Source

A NEW source for potash has been discovered which may develop into a new industry. It is being established near Denver, and consists in the production of potash in commercial quantities by the electrolytic decomposition of feldspar and leucite. The process is worked under a patent recently granted to Edmund Fuller and Thomas McCulloch. An abundant supply of the raw material exists within twenty miles of Denver, capable of being mined by benching in the open. Hence the cost is low.

The rock is crushed to about 60-mesh, decomposed in digesting pans, and electrolyzed in special earthenware cells to potassium aluminate, with accompanying complete segregation of the silicon. The special diaphragm cell is the crux of the process. The porous pot contains the cathode, immersed in water contained within the diaphragm. Surrounding this, and enclosed in the cell-body itself, is the sulfuric acid solution of decomposed feldspar, in which the anode is immersed. Impressed current ionizes the solution, and the alkali and the aluminum travel through the diaphragm, forming $KAlO_2$ at the cathode, amorphous silicon remaining as a sludge about the anode. This $KAlO_2$ is broken down by the action of the CO_2, resulting in aluminum hydrate and K_2CO_3, the latter remaining in solution, while the $Al(OH)_3$ is precipitated. These are the essential features of the process. The K_2CO_3 solution is decanted, and the remaining aluminum hydrate is washed and dried by an atomizing process. The potash solution is now in a state for the production of any desired commercial salt. The company is at present chiefly concerned with the production of 100 per cent soluble K_2SO_4, which is accomplished by digestion with gypsum, whereby a pure carbonate is precipitated.

A promising feature of this process is the large quantities of amorphous silica containing some aluminum compounds, which are separated from the circulating electrolyte—a material which will probably be welcomed by the ceramic industry. The company purposes to erect numerous plants near agricultural centers, where sufficient supplies of potash-feldspars, gypsum, and phosphate can be obtained, and to market a 100 per cent soluble material comprising a balanced proportion of potash, phosphate and nitrate. It is stated that a plant capable of producing 300 tons of K_2SO_4 will give, as by-products, 165 tons of Al_2O_3, and 700 tons of silica.

Airplane Service Between Denmark and Germany

TWO Danish Airplane companies have made application to the Danish Government for permission to establish a regular passenger and mail service by airplane between Copenhagen and Warnemunde, Germany. The shortest and most used passenger route from Copenhagen to Berlin is by way of train to Gjedser, Denmark, two hours by ferry to Warnemunde, and then by rail to Berlin. At present practically all of the Scandinavian and Baltic passenger and mail traffic to Germany is carried over this line, and during the past few months all trains have been crowded and the service very unsatisfactory. If the airplane service is established it will work in coöperation with a German company, which will install a regular service between Warnemunde and Berlin. On account of the unsatisfactory condition of the German railways the airplane passenger service should prove to be very popular with business men going to and from Germany.

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See What It Does for Your Teeth

This is to urge a ten-day test of a new, scientific tooth cleaner.

You have found, no doubt, that brushed teeth still discolor and decay. The methods you use are inadequate. There is now a better way.

The cause of most tooth troubles is a film. It is ever-present, ever-forming. You can feel it with your tongue.

That film is what discolors—not the teeth. It is the basis of tartar. It holds food substance which ferments and forms acid. It holds the acid in contact with the teeth to cause decay.

Millions of germs breed in it. They, with tartar, are the chief cause of pyorrhea.

That film is clinging. It gets into crevices and stays. So, despite your brushing, it may do a ceaseless damage. Teeth are safer, whiter and cleaner if that film is absent.

Science Now Combats it

Dental science, after years of searching, has found a way to combat film. Years of careful tests under able authorities have amply proved its efficiency. Now leading dentists all over America are urging its adoption. It is now used daily on millions of teeth.

This film combatant is embodied in a dentifrice called Pepsodent. And a 10-Day Tube is offered to every home for testing.

Pepsodent is based on pepsin, the digestant of albumin. The film is albuminous matter. The object of Pepsodent is to dissolve it, then to day by day combat it.

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The results are quickly apparent. A ten-day test is convincing. We urge you to make it at our cost and learn what clean teeth mean. Lest you forget, cut out the coupon now.

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Look in Ten Days

Make this ten-day test. Note how clean teeth feel after using. Mark the absence of the slimy film. See how teeth whiten as the fixed film disappears. In ten days let your own teeth tell you what is best.

War Work of the Merchant Marine

A PROUD war record is credited to the International Merchantile Marine fleets which combine in a single organization seven transatlantic steamship lines.

From August 1st, 1914 to November 11th, 1918, 14,988,294 tons (each ton 40 cubic feet) of cargo was carried. This included foodstuffs, munitions, rifles, motor vehicles, tractors, ambulances, airplanes, horses, mules, feed and often a cargo of 2,000 tons TNT on a single vessel. Late in 1917, when the Allied fuel shortage was most acute, 88,000 tons of oil were rushed abroad in the "deep" tanks of some of our vessels, as an emergency measure, and this helped to relieve a rather serious situation.

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Cellulose Acetate Dope

Methyl acetate	60%
Methyl ketone	10%
Benzol	15%
Acetone	10%
Diacetone alcohol	5%

Each gallon of dope made with the above liquids contained approximately seven to nine ounces of cellulose acetate, one ounce triphenylphosphate, and very small quantities of chemicals such as benzyl acetate, benzyl benzoate, and urea.

The various stabilizers and other solid

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ingredients in the dopes were used for specific purposes (such as to increase fire resistance and flexibility, or to prevent the development of free acid or "blushing"), but are not usually required where the "dopes" are to be used only as protective coatings.

Cellulose Nitrate Dope

Butyl acetate	20%
Ethyl acetate	50%
Benzol	30%

Each gallon of dope made with the above liquids contained from six to eight ounces of cellulose nitrate.

Cellulose nitrate "dope" is greatly improved as a protective coating by the addition of from five per cent to seven per cent of castor oil or treated tung oil. Greater elasticity of film, and slower evaporation result.

It is quite possible that celluose nitrate lacquers made on the above basis will find application in peace times for certain specific purposes where quick drying, hard, and elastic films are required. They may be admixed with pigments to produce colored coatings which dry to a flat, washable surface. When mixed with aluminum powder or zinc powder, quick drying, hard primers for metal are formed. These may be used satisfactorily as the base for many metal finishes. As substitutes for shellac on some types of work they should also prove of value.

For coating shells and similar metal objects, these paints should prove efficient, as they may be applied by spray, brush, or dipping, drying almost immediately to a moisture resisting, flexible film. Baking at a low temperature is permissible.

The writer has found clear or colored cellulose nitrate lacquers to act as excellent primers for certain types of cement floors that are to be painted. Through their use, waterproofing greases or other materials in the cement are insulated from action on subsequently applied enamels.

It should be pointed out that cellulose lacquers or enamels are not as durable as those made with oil or varnish. They are, however, useful for certain purposes where the longevity may be partly sacrificed to obtain rapid drying.

Protecting the Surface of Aluminum from Corrosion

WITHIN comparatively few years aluminum has proved itself applicable to hundreds of uses in the domestic and the industrial world. Unfortunately it is readily oxydized by prolonged exposure to air and is also attacked by many substances. Various attempts have been made, therefore, to plate it with some less sensitive metal. The galvanic process formerly employed for this purpose has not proved very satisfactory and has been generally abandoned. A better method has been recently described by Francis Marre in *Le Correspondant* (Paris). This consists in the reduction, in contact with the aluminum, of compounds which are readily dissociable—such as the chromic salts or the metallic chlorides; or else the production of charcoal deposits proceeding from organic substances such as the oils and the resins.

first step is the employment of [illegible]ury to obtain a superficial [illegible]idize the surface vigorously. [illegible]erupting the process of oxidation a layer [illegible]educible salt, a chromate for example, is then deposited upon the aluminum either by brush or by immersion; and the metal is then fired to a red heat. The chromium salts are deposited through the combined reducing action of the heat and of the oxidation of the aluminum, forming a complex and intimate precipitate with the oxide of aluminum; this precipitate, being combustible, adheres very strongly to the metal beneath it. This technique apparently gives rise to the formation of a double oxide of chromium and of aluminum which, penetrating the superficial

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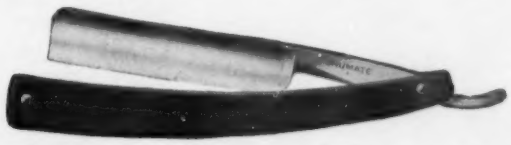

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ingredients in the dopes were used for specific purposes (such as to increase fire resistance and flexibility, or to prevent the development of free acid or "blushing"), but are not usually required where the "dopes" are to be used only as protective coatings.

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It is quite possible that celluose nitrate lacquers made on the above basis will find application in peace times for certain specific purposes where quick drying, hard, and elastic films are required. They may be admixed with pigments to produce colored coatings which dry to a flat, washable surface. When mixed with aluminum powder or zinc powder, quick drying, hard primers for metal are formed. These may be used satisfactorily as the base for many metal finishes. As substitutes for shellac on some types of work they should also prove of value.

For coating shells and similar metal objects, these paints should prove efficient, as they may be applied by spray, brush, or dipping, drying almost immediately to a moisture resisting, flexible film. Baking at a low temperature is permissible.

The writer has found clear or colored cellulose nitrate lacquers to act as excellent primers for certain types of cement floors that are to be painted. Through their use, waterproofing greases or other materials in the cement are insulated from action on subsequently applied enamels.

It should be pointed out that cellulose lacquers or enamels are not as durable as those made with oil or varnish. They are, however, useful for certain purposes where the longevity may be partly sacrificed to obtain rapid drying.

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WITHIN comparatively few years aluminum has proved itself applicable to hundreds of uses in the domestic and the industrial world. Unfortunately it is readily oxydized by prolonged exposure to air and is also attacked by many substances. Various attempts have been made, therefore, to plate it with some less sensitive metal. The galvanic process formerly employed for this purpose has not proved very satisfactory and has been generally abandoned. A better method has been recently described by Francis Marre in *Le Correspondant* (Paris). This consists in the reduction, in contact with the aluminum, of compounds which are readily dissociable—such as the chromic salts or the metallic chlorides; or else the production of charcoal deposits proceeding from organic substances such as the oils and the resins.

The first step is the employment of chloride of mercury to obtain a superficial amalgam and to oxidize the surface vigorously. Without interrupting the process of oxidation a layer of a reducible salt, a chromate for example, is then deposited upon the aluminum either by a brush or by immersion; and the metal is then fired to a red heat. The chromium salts are deposited through the combined reducing action of the heat and of the oxidation of the aluminum, forming a complex and intimate precipitate with the oxide of aluminum; this precipitate, being combustible, adheres very strongly to the metal beneath it. This technique apparently gives rise to the formation of a double oxide of chromium and of aluminum which, penetrating the superficial

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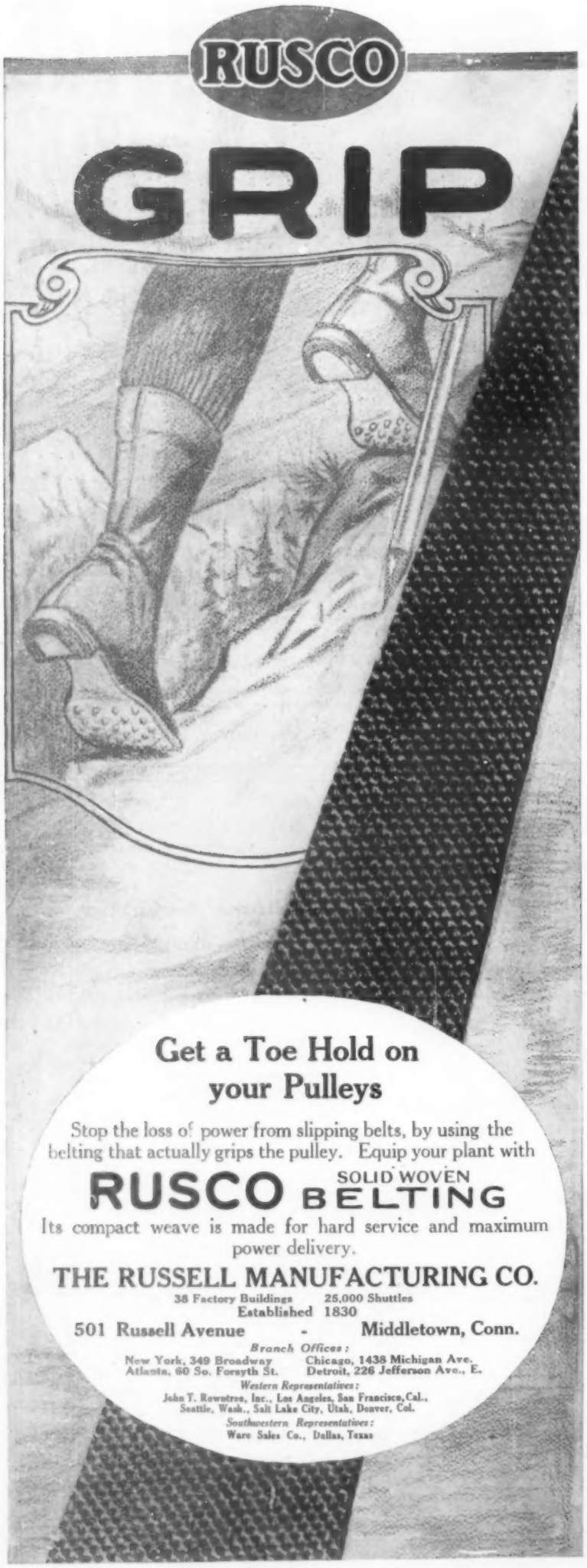
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layers of the metal which has been brought to a red heat, constitutes a coating which possesses a high degree of mechanical resistance, thus protecting the article from the oxidizing action of the air and permitting it "to go to the fire" with impunity. The same manner of procedure is employed with solutions of metallic chlorides, whose reduction is easier and more rapid than that of the compounds.

It is readily comprehensible that the color of the deposits will vary according to the reducible body employed, according to the quantity of the oxide which is allowed to form, and finally, according to the conditions of the fire. Thus we find shades varying from light green to pure black and passing through the whole scale of grays and browns. The conditions required to obtain a given color can be determined only by experiment. We are concerned here, in fact, with a sort of superficial alloy; but contrary to most metals the color of the alloys of aluminum is not necessarily intermediate between the colors of the two components. Thus with platinum there is obtained a "changeable" purple alloy; with cobalt and nickel the color is almost yellow; while palladium gives a warm pink.

It can be readily seen that it is possible to obtain highly artistic effects by means of these colored protective coatings; furthermore, it is easy to conceive of methods combining the ones given in various manners, so as to make use successively of the metallic chlorides and of the reducible salts. In the course of the oxidation one can put on a layer of metallic chloride whose rapid reduction yields colored precipitates over which another layer of salts of chromium is applied before the temperature is raised to a red heat.

Similar effects can be readily obtained by slowly calcining organic matters which are sufficiently fluid to be spread upon the object and sufficiently rich in carbon. Both these conditions are fulfilled by the oils and the resins. As soon as the aluminum has been covered with such a layer it brought to a red heat in order to cause the combustion of the oil or the resin, and at this temperature the residual carbon penetrates the metal superficially, forming a solid aggregate with it.

The processes just described are obviously preferable to that formerly recommended which consisted in attacking the metal superficially by a dilute solution of hydrofluoric acid; furthermore, the only color obtainable by this method is a silvery sheen.

Certain formulas have been likewise proposed according to which complex mixtures in solution in a suitable vehicle, such as alcohol or ammonia, are employed; upon heating the solvent is liberated and the elevation of the temperature likewise insures the penetration of the metal by the various constituents in a greater or less state of reduction.

Still another method by means of which a beautiful dull black can be obtained has been described in a German technical journal *Zts. f. Feinmechanik* (1913 II), as follows: A bath is prepared containing 150 grams of bichloride of antimony, 100 grams of hydrochloric acid and a liter of 90° alcohol. The aluminum, previously thoroughly cleansed by a solution of sulphuric acid diluted with a third as much water, and acting at about 65° Centigrade; the alcohol is then ignited and allowed to burn. Upon the grayish deposit thus obtained there is spread a varnish consisting of 10 grams of nigrosine and 50 grams of sandaraque per liter of alcohol. This is then dried in an oven and afterwards covered with a coating of linseed oil varnish. It is extremely probable that the resistance of this protective layer is no greater than that of the varnish employed. Hence it seems preferable to have recourse to the combined use of reducible salts and a temperature raised to a red heat.—By *M. Tevis.*

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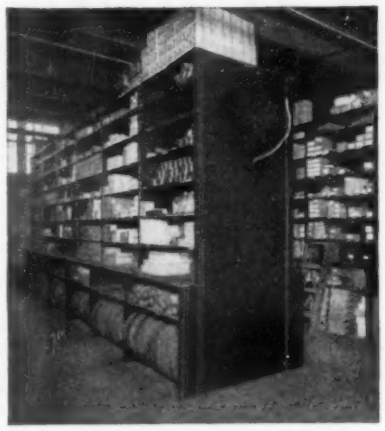

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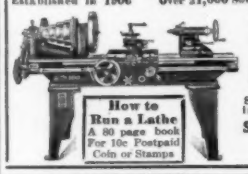

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Tin Stocks

NOW that approach to normal conditions is being made, there is naturally considerable speculation as to the quantity of tin at the various sources of supply, also as to the probable quantity stored at points in eastern and western Canada for immediate shipment into the United States after August 1st, 1919. The bulk of the tin in the Federated Malay States, and the Dutch East Indies, is held by the respective governments, which assumed control in order to take care of the surplus stocks accumulated as a result of the embargo on shipments into the United States, some of the principal markets of Europe being unavailable.

It is estimated by good authority that the Malay government is carrying 6,000 to 7,000 tons of tin, and the Dutch Government 3,000 to 4,000 tons, while the stocks in Hongkong are estimated at 3,500 to 4,000 tons. How much Chinese and Australian tin has been shipped into western Canada ready for entry into the United States is not definitely known, but it is thought to be an important amount. The tin stocks in London and Liverpool, according to recent advice, are around 2,000 tons, of which 676 tons are English tin available for entry into this country on August 1st.

British National Housing Scheme

THE British government is reported to be placing huge orders for building material, and it is stated that 900,000,000 bricks are to be bought and 1,000 standard doors purchased at a time. A separate government department has just been formed under the Ministry of Supply to deal with the housing needs of the country, in conjunction with the Housing Department of the Local Government Board. Mr. Drower has been appointed head of the new department, with offices at Caxton House, Westminster, London.

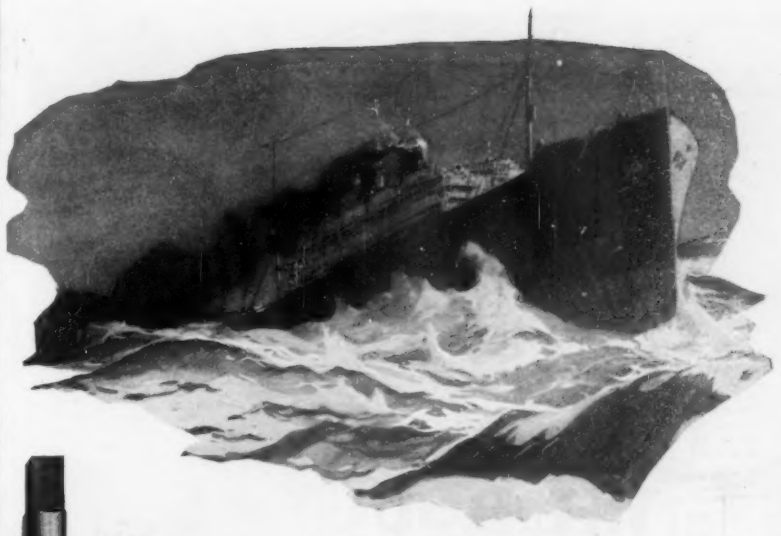
Arrangements are being made for the supply of materials (bricks, grates, stoves, general house sundries, glass, doors, windows, joinery, etc.), for workmen's dwellings built by local authorities and public utility societies, both these agencies being treated by the government on the same basis.

It has been decided to place government orders with brickyards through the Brickmasters' Association and others concerned in the trade instead of giving government subsidies to the trade for equipment and assistance. Accordingly the government has placed orders for 900,000,000 bricks to be delivered this year, which is judged sufficient for the year's supply. Of these, 250,000,000 bricks are now ready for delivery and another 250,000,000 will be ready within the next few months. A fixed price has been quoted, beyond which tenders cannot go. The Building Department will provide the railway facilities and deliver the bricks to the nearest station, the Director of Supplies, of course, stipulating that the nearest brickyards should serve a locality.

It has not been found necessary to attempt purchases on a large scale of general sundries like tiles, slates, sanitary fittings, grates, and chimney pieces, but the government has made a sufficient number of purchases to insure that supplies of these will be forthcoming in the next few months, while leaving the market free enough to find its own level. One advantage has accrued from recent investigations, since these showed that there was an undue multiplicity of types of grates and stoves. Accordingly the government is reducing the number of types it purchases so as to get a measure of standardization.

Arrangements have been made for the supply of all the glass needed, all of which it is stated, will be of British manufacture at reasonable prices.

It has now been definitely ascertained that there is in the country well-seasoned timber sufficient to last until the end of the year. This is due largely to the fact that since the armistice stores of timber brought in on War Office orders have been diverted to trade.



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The only branch of industry that is causing the government anxiety in connection with housing is joinery, as distinct from carpentering. Before the war door and window frames were imported in large quantities from Sweden. The problem considered was whether special factories should be set up in big centers for their manufacture, or whether the trade should use and extend its own plant and workshops for the local supplies. The Building Department has decided to adopt the latter method, by which, it is judged, transportation will be saved and local labor utilized.

Small variations in the size and shape of doors and windows will be discouraged and architects will be supplied with a selection of the simpler types to choose from. By this means, it is thought, 1,000 doors can be ordered at a time. In the case of windows the department will encourage the use of the same sized sashes as units, the larger windows to be made of multiples of these. Where there are no large joiners, shops in a district arrangements will be made through the local master builders' federation to extend or build them.

Animal Weather Prophets

MERE superstition,' so the weather authorities say, are many of the long-distance weather predictions based on the conduct of animals. No one, so far as we know, has compiled a record of these so-called omens, but their number is multiple. They are based on a belief that animals are able to tell months in advance, for example, the character of the coming winter. If hunters bring in a story to the effect that squirrels have made heavy stores of nuts, it is taken to mean that a severe winter impends. If early-caught fur-bearing animals have a heavy, thick coat, that is another sign of a severe winter, or a thin coat, the contrary. If bird migrations are delayed after the usual date of the southward flight, a sign is seen of an open winter. Numerous other beliefs based on fancied ability of animals to foresee weather conditions months ahead, and base their preparations on them, have wide currency. Sometimes signs are taken from the vegetable world, as for example the past fall in the Middle West. Corn husks, it was related, were much reavier than usual—that meant a hard winter.

The reasoning, such as it is, in many of these weather signs, is apparent on the surface. In the case of others it isn't, as with the most famous and well-known of them all—the ground-hog sign. If Mister Woodchuck on Candelmas day—February 2—sees his shadow, issuing experimentally from his den, then "winter will have another flight." Otherwise an early spring impends.

Observation over a part of a singe lifetime would demonstrate most of these weather signs as unreliable, yet they cling on, especially in country districts. It is possible that they do so, in part, because they shadow into animal signs of a different class which really are dependable. From the conduct of animals, accurate weather predictions can, within certain limits, be made.

This dependable class of animal weather signs is uniformly short-distance as to prophecy—no longer than the daily newspaper weather forecast. They occur because animals are more sensitive to atmospheric changes than human beings, and sense an approaching weather change hours before it is apparent to man. In this capacity, animals are really nothing more nor less than barometers, registering as accurately as the most delicately-constituted instrument in the meteorological observatory.

One animal barometer in this class much observed east and west during the summer season is the swallow. The swallow is insectivorous to the *-nth* degree. Other than insects hardly pass its bill from one's season's end to another, and it captures this food on the wing. Thus it happens that as a weather forecaster the swallow on thousands of farms is always ready with an answer.

Swallows flying high indicate fair weather. Swallows flying low presage a storm. The explanation of these "signs" is simple. The relative level at which swallows fly is determined by the whereabouts of insects. The lighter the atmosphere, as in the case of fair weather or clearing weather, the higher will insects be found, while an oncoming storm, presaged by growing density, forces them to levels near the ground, where the swallows will be noticed in pursuit of them.

It has been observed by New Englanders that ants, sensing an approaching rain, will close the entrance to their small hills, and conversely, as weather clears, will open them. To this extent ants are found reliable forecasters. Instinctively they react to changes in the atmosphere, and close their hills for protection against water.

A late fall and winter weather sign which many country boys using box traps have learned the accuracy of is furnished by the small coney rabbit, in rare cases by the more wary jack rabbit. These boy trappers note that catches of rabbits are always better just before a storm—the longer and more severe that storm proves, the more numerous the rabbits caught. Here again a change in the atmosphere has warned the rabbit tribe that a spell during which food will be hard to obtain is at hand, and instinctively to "fill up," even to the point of entering traps they formerly had avoided. Country boys of New England know that if there is ever a time when a rabbit will enter a box trap, it is just before a snow storm.

Doubtless other instances in which wild creatures function in the rôle of genuine weather forecasters could be advanced.

The Community Laundry

THE community cooking centers have been tried in all parts of the country and now the idea is extending to other branches of house work. The day of large houses is passing, and, in the large cities the population is obliged to resort to apartments with the result that the family is very much upset if extra work is carried on there. Yet many people are particular about their laundry and would prefer to do considerable of it themselves.

In the city of New Haven the Civic Federation has tried a novel plan by which a place has been provided where women may go to do their own washings under most favorable conditions. Twenty families took shares in the expense of the plant, situated in quarters provided by the Y. W. C. A., and each family paid $25. A superintendent and three women workers were hired. Next two washing machines, a mangle and three electric irons were installed. Each family was allowed forty pounds of laundry a week and after an adequate test the result was found to be about fourteen cents a pound for the expense. This included the cost of operation, labor hire, and rental of the plant.

This first unit is carrying all the work that it can possibly manage and other units will have to be formed in various parts of the city. The financial returns have been such that the initial sums used by the first families to cover first necessary expenses will soon be liquidated.

It is expected that the experiment will result eventually in very low charges for the use of the room, equipment, etc., and that it will not only be a long stride in a sanitary measure but an economic consideration which will appeal to many classes. There are large numbers of people living in hotels where absolutely no washing is allowed, and, while it is not a matter of money, there are many pieces of laundry too choice to be trusted to the average laundry. There are also vast numbers of working women who have a few extra hours after work who would be very glad to keep their clothing in a better condition if this were personally possible.—*B. M. Buell.*